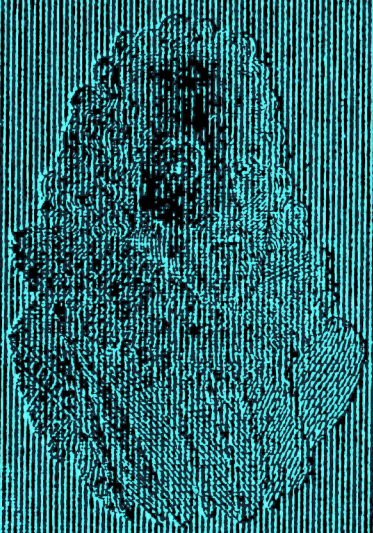
Encyclopædia Metropolitana.



First Division.

Pure Sciences.

3

CABINET EDITION OF THE ENCYCLOPÆDIA METROPOLITANA.

PROSPECTUS.

JUST PUBLISHED, HANDSOMELY PRINTED IN CROWN OCTAVO,

COLERIDGE ON THE SCIENCE OF METHOD,

BEING PART I., PRICE ONE SHILLING,

(*To be continued in Weekly Parts and Monthly Volumes,*)

OF

A SECOND EDITION, REVISED AND CORRECTED

OF THE

ENCYCLOPÆDIA METROPOLITANA,

OR,

System of Universal Knowledge;

ON A METHODICAL PLAN,

PROJECTED BY SAMUEL TAYLOR COLERIDGE.

Φαίνεται οὔτε πέρας, οὔτε τελεύτην ἐχων· ὅτι πρό τε τῆς ἀρχῆς ἄλλη ἀεὶ φάινεται ἀρχὴ· μετά τε τὴν τελευτὴν ἑτέρα ὑπολειπομένη τελευτὴ· τὰ μὲν ἐλλείπειν, τὰ δὲ πλεοναζειν, θρύπτεσθαι δὲ, οἶμαι, κερματιζόμενον τὸ πᾶν ἀνάγκη· Οὐκοῦν δὴ φανῆναι καὶ ἀπτόμενα καὶ χωρὶς ἑαυτῶν, καὶ κινουμένα πάσας κινήσεις, καὶ ἑστῶτα πανταχῆ, καὶ γιγνόμενα καὶ ἀπολλύμενα καὶ μηδέτερα, εἰ ἑνὸς μὴ ὄντος πολλά ἐστιν;

ΠΛΑΤΩΝ· Παρμενίδης.

"The strength of all sciences, which consisteth in their harmony, each supporting the other, is, as the strength of the old man's faggot, in the band. FOR WERE IT NOT BETTER FOR A MAN IN A FAIR ROOM TO SET UP ONE GREAT LIGHT, OR BRANCHING CANDLESTICK OF LIGHTS, THAN TO GO ABOUT WITH A SMALL WATCH CANDLE INTO EVERY CORNER?"

BACON. *Advancement of Learning*, Book I.

LONDON:

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AND RICHARD GRIFFIN AND COMPANY, GLASGOW.

1849.

PROSPECTUS.

1. AN ENCYCLOPÆDIA is indispensable to every library, as a *concentration* of human knowledge; while to the voyager, the naval and military officer, the colonist, and that numerous class of enterprising Britons whose want of a settled residence may isolate them from the world of letters, it is the only possible *substitute* for all other books. Works of this description are therefore among those few literary projects which have uniformly secured the patronage of the public. The reason is obvious: an Encyclopædia is to the rising education of the country at once a reservoir and a fountain—it receives perpetual accessions of knowledge from the genius of the age, which it yields again in willing abundance to posterity.

2. With the ancients, the term Encyclopædia, explained itself. It was really *Instruction in a cycle, i. e.* the cycle of the seven liberal Arts and Sciences, that constituted the course of education for the higher class of citizens. Unfortunately, the inapplicability of a strictly *scientific* method to a modern Encyclopædia, such as shall include the whole of its contents, has led to the abandonment of all principle of *rational* arrangement; and it may be safely asserted of all our universal dictionaries hitherto, that the chief difference between them, in respect of their *plan*, consists in the more or less complete disorganization of the Sciences and Systematic Arts; now retaining certain integral portions of the system as integers, forming each an entire treatise, but resigning these treatises to the places severally assigned to them by the accident of their initial letters; and now splintering all alike into their fractional parts, with an arrangement merely alphabetical. Nor has the imperfection rested here. This very alphabetical position was but too frequently determined by the caprice or convenience of the compiler; inasmuch as the division of parts into minor parts had no settled limit. Thus, one technical or scientific term included as its subordinates, and to be explained in the same article, sometimes more, sometimes fewer, other terms: and the arrangement became neither properly scientific, nor properly alphabetical. It had the inconveniences of both, without the advantages of either.

3. The results are such as might have been expected, in part from the necessity of such plans, and in part from the interference of individual whim, carelessness, and procrastination, to which it afforded the amplest opportunities, and even frequent temptation. Numerous articles of important information are found where the reader could have least expected to find them; while articles of equal interest are in many cases not to be found at all.

4. A second result is, that an Universal Dictionary so constructed, equally with an Encyclopædia the most methodically arranged, requires alphabetical references; but with a twofold inconvenience, from which the latter would be free. First, the references, instead of being collected in one appropriate index, or at least in some known portion of the work, are scattered throughout the whole; and this is no slight annoyance, when a scientific term happens to have many synonyms, as, for instance, Azote, Nitrogen, Phlogisticated Air, &c. Secondly, the references must eventually lead the reader through as many volumes, as those other words happen to be placed in, which are necessary to be *previously* understood in order to a tolerable comprehension of the term first sought.

5. A third evil, resulting from the same causes, is the utter want of all proportion in the space occupied by each article, relatively either to the importance of the particular subject, or to the promised limits of the whole work. Hence, too, it arises that the proprietors are frequently reduced to a choice of evils. The work must be extended far beyond the first expectation of the purchasers, or the articles assigned to the latter volumes must be crowded in scanty and superficial abridg-

ments. They contract to give the public an Universal Dictionary of the Arts and Sciences, but the execution outgrows the plan. Either openly then, or in the form of supplementary volumes (bearing perhaps a large proportion to the whole work), this pledge must be redeemed. In both cases the disorder and dislocation, and in many instances the deficiencies, remain unremedied.

6. The fourth ill consequence of this arbitrary arrangement calls for a somewhat fuller consideration. It requires but a moment's reflection to be convinced, that the most voluminous Encyclopædia which has yet appeared, is incomparably too narrow to contain an Universal History of Knowledge in its present state; and that the authors and compilers will have satisfied all rational expectations if only nothing shall be found excluded from any other cause than the higher importance of that which has been admitted; in order that on *all* subjects the ends of *general* information at *least* may be accomplished. Where, therefore, selection is so imperiously required, there must be an equal necessity that certain fixed and intelligible principles should be pre-established. An Encyclopædia neither is, nor can reasonably be considered as, the book which a man of profound science is likely to consult for those things in which he is himself eminent. He will seek for accessions to his knowledge in the works of contemporaries employed like himself in extending the pomœria of science, and will often be most interested in *speculations*, the worth and stability of which are yet undetermined. But an Encyclopædia is a *History* of human knowledge, in which therefore these intellectual embryos, which at best are (as it were) but truths in the *future* tense, have no rightful or beseeming place. This, indeed, we hold to be a principle of such paramount importance, that we take the earliest opportunity of avowing our determination of a strict and systematic adherence to it; and we here give our public pledge that the ENCYCLOPÆDIA METROPOLITANA shall be so far *historical* in all respects, that only what has been *established*, or is at least already *publici juris*, and to be found in the records of Science and Literature, shall form the main body of every article; and that any opinions or speculations of the writer himself shall be declared to be such, and be given distinctly as a mere appendix of the article to which they belong.

7. We shall now particularize the evil to which we have been referring. From the licence which the planless plan of former works allows to the separate writers—in one place, instead of a systematic history of the received truths and established discoveries in the department of knowledge, which was to have been exhibited, the larger portion of the space is filled up with the individual writer's own crude conceptions and prolix argumentation—while in another, on some subject of the highest interest, lo! in tarnished fragments over the numerous volumes, an old work torn asunder by all the letters of the alphabet! and reminding the classical reader of the decrepit Pelias, whose credulous daughters were induced by the artifices of Medea to cut his aged limbs in pieces, as the sole and certain means of restoring him, like another Æson, to the blooming honours of youth.

8. The SCHEME which we propose to substitute, or the principal outlines of the ENCYCLOPÆDIA METROPOLITANA, we now lay before the reader, as follows:—The work will consist of four main divisions. The first, which for the sake of distinction we have called the Philosophical part, comprises the Pure Sciences; and the second, or Scientific part, the Mixed and Applied Sciences. The third, or Biographical part, is devoted to Biography chronologically arranged, History, Chronology, and Geography; and the concluding or Miscellaneous part, besides being referential and supplementary to the preceding volumes, will have the unique advantage of presenting to the public, for the first time, a Philosophical and Etymological Lexicon of the English language; the citations selected and arranged chronologically, yet including all the purposes of a common Dictionary. The volume of Index will complete this division. It will be instantly seen that the first two divisions of a work, thus arranged, will grow naturally out of each other; the needful references will therefore be generally *retrospective*, and rarely made to future volumes. In our Biographical department we shall teach the same truths by example, that have been evolved in the former divisions, and stimulate to the exertions that have developed them;—while in our Miscellaneous

portion or in the Index, every word will be found in its usual alphabetical place, as in any other Dictionary, with a plain reference to the volume and page containing its full explanation in the present work; together with a variety of interesting articles, either illustrative of the former divisions, or in their own nature miscellaneous. Each division of the work will be separately paged.

9. Such is the general outline of the proposed Scheme. The Table at page 13 places the principal subdivisions, likewise, before the reader's eye, with as much detail as is compatible with the limits, or requisite for the purposes, of a Prospectus. It will be seen, too, that a more particularized and systematic justification of the principles, on which the Scheme has been constructed, will be afforded in the Preliminary Treatise, or General Introduction to the Encyclopædia.

10. When the work is completed, it will appear as an orderly Digest of all the great points of human knowledge, and, notwithstanding its comparatively moderate extent and price, must form the most perfect system of intellectual instruction and entertainment, that has been hitherto submitted to the friends and patrons of Art, Science, History, and general Literature in Great Britain.

11. We would place our claims to the favourable attention and patronage of the public, on two grounds: 1. That the great outline of our plan is free from the numerous defects and inconveniences *involved* in the plan of all preceding works of the kind, or occasioned or permitted by it. 2. That the plan now substituted possesses great *positive* advantages, peculiar to itself.

12. From what has been already seen of our plan, in the necessary discussion of its relative merits, we presume that we appropriate to the work the title of an Encyclopædia by an especial right, and that of a Philosophical System on a plea of superior propriety. But we cannot neglect the argument for such a work as the present, which is derivable from the peculiar circumstances of our times. The political changes of the world have not been more wonderful than the scientific and moral revolutions that have occurred within the last few years. The new views, new discoveries, and fresh facts, especially in all the different branches of Experimental Philosophy, which every year has brought with it, are unparalleled in the history of human knowledge; and the accessions have not seldom been of such a nature as no mere supplementary postscript can embrace. For in many instances they affect the whole theory and consequent arrangement of the Art or Science to which they belong. Our project is in this respect therefore singularly fortunate in point of time. It will have to collect and combine the rich but scattered elements of future Science; while a still more important argument for our plan and for the period of its execution, will be found in the manifest tendency of all the Arts and Sciences at present, from the most purely intellectual even to the labours of the common mechanic, to lose their former insulated character, and organize themselves into one harmonious body of knowledge. The civilized world is now doing that which the ENCYCLOPÆDIA METROPOLITANA is preparing to do; and for which it is providing a correspondent repository.

13. The Proprietors have not disguised from themselves that their undertaking is of the most *arduous* kind. The mass of ability requisite, will be great in proportion to the originality of our plan; and the perseverance, harmony, and punctuality, that are indispensable conditions of its success, must be commensurate with the difficulty of uniting variety with system, and of reconciling selectness and calculated proportion with universality as a whole, and fulness in each component part. If, in addition to this, the amount of capital demanded and already dedicated to the one purpose of securing this coalition, and of overcoming these difficulties, be considered; with the number and high character of the artists, the men of science, and men of letters, on whose zealous co-operation, now pledged to us, we rest our pretension to the first acts of the public favour, and our confident hopes of continued support—not forgetting the relief and moral influence of a regular employment afforded during all seasons of the year to so many industrious mechanics as must necessarily be engaged on this work—the Proprietors of the ENCYCLOPÆDIA METROPOLITANA dare promise themselves, that by no reflecting reader will the present prospectus be deemed too serious.

14. Having explained the *Principles* on which the Encyclopædia Metropolitana was founded, we proceed to state a few facts, in reference to the manner in which the FIRST EDITION of the work was executed, and the *Modifications* now intended to be made in the SECOND EDITION.

15. The Encyclopædia Metropolitana was projected by the late eminent poet and philosopher, S. T. COLERIDGE. It differs in its plan from other Dictionaries of Universal Knowledge in being strictly methodical. The contributions of the scientific and learned men by whom it was composed, are arranged, not according to the letters of the alphabet which happen to form the initials of the English *names* of the Treatises, but in agreement with a PHILOSOPHICAL SYSTEM, based on the *nature* of the Subjects,—a method which causes the entire work to become a rational exposition of the state of human knowledge, and the mutual dependence and relative importance of its different branches. In virtue of this classification, the work forms both a course of study for the scholar, and a book of reference for the man of business: the former has the principles of the sciences laid before him in the philosophical order of their natural sequence; the latter is enabled to find readily the specific information he requires on any subject that interests him.

16. The system, projected by Mr. Coleridge, was ably executed by the Editors * and Authors to whom the execution of the scheme was confided. To confirm the truth of this assertion, it is sufficient to refer to the names of the Authors, and to state the fact, that many of the Treatises have been admitted by the Learned throughout Europe to be of the highest order of merit, and to have enlarged the boundaries of the scientific world, and placed their authors in the first rank of men of science in the present age.

17. The following ABSTRACT OF THE CONTENTS OF THE QUARTO EDITION, taken from the GENERAL PREFACE, will show in what manner the early professions of the projector of the work were realized.

We shall speak of the four great divisions of the Encyclopædia separately.

PURE SCIENCES.

18. The order in which these sciences are exhibited, and the plan on which the MATHEMATICAL portion of the *Encyclopædia* is conceived, resemble considerably the series of Elementary Treatises projected many years ago for the University of Cambridge by Dr. Wood, the late Dean of Ely, and Professor Vince; but with this difference, that the present volumes are far more comprehensive in the subjects they embrace, and far more elaborate and scientific in their execution. But this very similarity shows that the *Encyclopædia Metropolitana* has attained one of its professed objects,—systematic instruction and scientific information, conveyed—not in a confused mass, but in the natural sequence of the sciences.

Indeed this portion of the work has met with a degree of approbation in many quarters, but especially in the University of Cambridge, which no other Encyclopædia has ever yet received. The student who has really mastered these sciences in the systematic form in which they are arranged here, will never in the course of the longest life find occasion to *un*learn any portion of what he has here acquired, and will find no difficulty whatever in adding to his stores any new results which the mental energy and labour of mankind may hereafter develop from principles now known. It may, indeed, be safely affirmed, that any person of good mathematical abilities, who shall follow the course of Mathematical treatises in this Encyclopædia, which are so arranged that a student may pursue them even without the assistance of a tutor, may become by that means a mathematician of very high character, and be enabled to master the most difficult and delicate speculations of continental mathematicians.

19. The names of the authors of the Treatises on *Pure Mathematics* are suffi-

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The EDITORS of the original edition of the Encyclopædia Metropolitana were—The Rev. EDWARD SMEDLEY, M.A., late Fellow of Sidney College, Cambridge; the Rev. HUGH JAMES ROSE, B.D., late Principal of King's College, London; and the Rev. HENRY JOHN ROSE, B.D., late Fellow of St. John's College, Cambridge.

cient to prove that the *Encyclopædia* is worthy of the present state of science, and that its most important articles are contributed by those who have themselves been foremost in the onward march of science. The elaborate Treatise on ARITHMETIC, by the present Dean of Ely (Dr. Peacock), Lowndian Professor of Mathematics in the University of Cambridge, is interesting alike to the scholar, the mathematician, and the speculator in metaphysics. The brief but comprehensive Treatise on TRIGONOMETRY, by Professor Airy, now Astronomer Royal, is of considerable value from the general elegance of its demonstrations. The publications of the Rev. H. P. Hamilton on ANALYTICAL GEOMETRY and CONIC SECTIONS, and that of Professor Barlow on the THEORY OF NUMBERS, are so highly esteemed, that any eulogium on their papers on these subjects would be superfluous. The Treatises of Professor Levy on the DIFFERENTIAL and INTEGRAL CALCULUS are calculated to carry the student to a very high point of proficiency. The GEOMETRY, ALGEBRA, and GEOMETRICAL ANALYSIS complete the Volume in a manner worthy of the treatises with which they are associated.

20. These sciences are, however, in some degree elementary; and although by them the student would be so far advanced as to enter upon the works of some of the ablest analysts, it would be unworthy of such a publication as the Encyclopædia Metropolitana to leave untouched or imperfectly treated, the more refined applications of the higher Calculus. It will be found, accordingly, that the highest branches of mathematical analysis have been treated by writers conversant with all its intricacies, and the mathematical student is furnished in them with results of far greater variety and of a more subtle nature than can at present be used in the application of analysis to Mixed Mathematics.

21. The CALCULUS of VARIATIONS, and the CALCULUS of FINITE DIFFERENCES by Professor Hall, are distinguished by the clearness peculiar to his treatment of these refined and subtle portions of analysis. The CALCULUS of FUNCTIONS and the THEORY of PROBABILITY are the work of Professor De Morgan. The latter (on a subject which has exercised the talents of the greatest mathematicians, even down to the times of Laplace) is, as might be expected, one of the most complete in any language. The Treatise on DEFINITE INTEGRALS completes the series of these elaborate surveys on the higher branches of Mathematical Analysis. The name of Professor Moseley is a sufficient warrant that his Essay is also of the highest character.

22. Without wishing, therefore, to offer any undue eulogium on the Treatises enumerated above, we confidently ask that portion of the public which is qualified to judge of their merits, to compare the whole system of *Pure Mathematics* here presented to them with that in any similar work, whether of this country or of the Continent, on the grounds of *arrangement*, *clearness*, *ability*, and *completeness*.

23. We must now allude to such of the Pure Sciences as are not included in the Mathematical department. Sir John Stoddart has given a lucid and able summary of the General Principles of GRAMMAR, or the Philosophy of Language. The LOGIC and RHETORIC of Archbishop Whately require no commendation here, as they have long since been published in a separate form, and have taken their place among the standard works of our language. The Treatise on LAW is the work of Richard Jebb, Esq., Professor Graves, and Archer Polson, Esq. It embraces one of the most difficult portions of Philosophy—the general foundations of Law and Morals; and the Editor is happy to state that testimony from the very highest quarters has been given both to the profoundness of the views entertained, and the ability with which they are developed.

24. In the present state of metaphysical knowledge, it would be presumptuous to put forth any *system* of Metaphysics; but a general HISTORY OF MORAL AND METAPHYSICAL PHILOSOPHY affords the most convenient opportunity for displaying the principles on which the greatest philosophers have hitherto endeavoured to form their systems, for pointing out their difficulties, and for marking how far each has contributed to the progress of the science. Such a sketch, however, required the hand of a master; and the Editor confidently believes that the Treatise on Moral and Metaphysical Philosophy which is here given is calculated fully to sustain the

deservedly high reputation of the Rev. F. D. Maurice. Of the Outlines of THEOLOGY, it does not become the Editor to say more than to acknowledge with gratitude the very able assistance of Professor Corrie, to whom two chapters are due. He has endeavoured to render this Treatise as practically useful as possible, not only to avoid passing controversies, but to bring forward the sound and genuine doctrines of the Church of England; and perhaps he may be allowed to add that, in pursuance of this object, he has spared no pains or labour.

MIXED AND APPLIED SCIENCES.

25. From *Pure Mathematics* we proceed in natural order to their application to physical phenomena. Of these sciences, some belong to the elementary branches of physical knowledge, and others to a higher and more advanced stage. Now, the treatises on MECHANICS, HYDRODYNAMICS, PNEUMATICS, OPTICS, and PLANE ASTRONOMY, have been written by Professor Barlow with an express view to this distinction. They are elementary enough to enable any student, with a competent knowledge of Pure Mathematics, to overcome their difficulties; and yet they are so based on scientific principles, that they will also prepare him to enter readily on the higher branches of Mixed Mathematics. In *Mechanics*, more especially, a foundation is laid for the succeeding investigations of Physical Astronomy, which is, in fact, only one of the higher branches of Analytical Physics.

26. Some of the treatises in the volumes devoted to the Mixed Sciences demand a separate notice, as enlarging the boundaries of our scientific knowledge. Of this class are the Treatises on LIGHT and SOUND, by Sir J. F. W. Herschel. The Treatise on LIGHT, by Sir J. F. W. Herschel, from the position it has already obtained in the scientific world, both in England and on the Continent, cannot require any recommendation here. The simple mention of Sir J. F. W. Herschel's name is a sufficient recommendation to the Treatise on PHYSICAL ASTRONOMY, and proves at once that it must be an Essay of the highest order of merit, and worthy of the present state of the Science; and the conductors of this *Encyclopædia* may justly be proud that that distinguished writer has contributed so largely to its pages. But although Plane and Physical Astronomy had been thus ably treated, it was considered that something more was required; and the late Captain Kater kindly furnished the very useful and able Treatise on NAUTICAL ASTRONOMY, a subject with which his acquaintance was at once profound and practical.

27. MAGNETISM and ELECTRO-MAGNETISM are treated by Professor Barlow with the same ability and research which he has displayed in the other Essays contributed by him; and GALVANISM, by Dr. Roget, whose scientific character is too firmly established to leave any doubt as to the merit of his contributions. The author of the Treatises on ELECTRICITY, HEAT, and CHEMISTRY, the late Rev. F. Lunn, was one whose merits as an experimental philosopher and chemist were not so extensively known as they deserved to be; but at Cambridge his acquirements were acknowledged to be of the highest order. The treatises themselves, it is believed, will amply justify their favourable anticipations.

28. The Third Volume of *Mixed Sciences* is chiefly devoted to the FINE ARTS; but there are two or three Essays in the early part of the Volume which belong to the more exact sciences, viz., the Essay on the FIGURE OF THE EARTH, by Professor Airy, the present Astronomer Royal, and his Treatise on the TIDES. With regard to the former much novelty was hardly to be expected; but it is presumed that this Treatise contains the most complete combination and discussion of observations relating to the subject hitherto produced in England. The treatise into which this great mathematician has thrown all his power is the Theory of the Tides. The terms in which some of the most distinguished mathematicians of Cambridge have spoken of this treatise prove that they consider it to have greatly advanced the knowledge of this difficult subject. Every previous treatise on the theory of the tides is entirely superseded by this production, and it will supply, for many years to come, the only sound foundation of our knowledge upon this subject.

29. The Treatise on POLITICAL ECONOMY was written by N. W. Senior, Esq.

30. The Treatises on BOTANY and HORTICULTURE are supplied by G. Don, Esq.,

whose profound acquaintance with every department of knowledge which belongs to the vegetable kingdom is known to all botanists and florists. The ZOOLOGY combines GENERAL PHYSIOLOGY with COMPARATIVE ANATOMY, and is the work of J. F. South, Esq., Surgeon of St. Thomas's Hospital (assisted in one portion of Physiology by Mr. Clark and Mr. Solly). The descriptions in this Treatise possess the very unusual and peculiar merit of being given by Mr. South, in every practicable instance, *from the specimens themselves.* Of the ANATOMY, by Mr. South and Mr. Le Gros Clark, and the MATERIA MEDICA, by Dr. G. Johnson, it may be said that their names are a sufficient pledge that these Treatises are of first-rate character. The Treatise on MEDICINE, by Dr. Robert Williams, of St. Thomas's Hospital, is an attempt to give a more philosophical view of the classification of disease than has hitherto been taken in any work of modern date. To W. Bowman, Esq., the Encyclopædia is indebted for an able outline of SURGICAL PRACTICE. The medical volume is closed by a comprehensive Treatise on VETERINARY ART, by W. C. Spooner, Esq.

31. The METEOROLOGY of the late Mr. Harvey, and the CRYSTALLOGRAPHY of Mr. Brooke, have been referred to respectively with especial commendation by Professor Forbes and Dr. Whewell. The names of Mr. Phillips and Dr. Daubeny will sufficiently recommend the Treatise on GEOLOGY, as exhibiting an adequate representation of that science at the time of its publication. The Treatise on MINERALOGY by Mr. Brooke; the Essays on CARPENTRY, by P. Nicholson, Esq.; on FORTIFICATION, by Major Mitchell and Captain Procter; and on NAVAL ARCHITECTURE, by the late Mr. Harvey, must not be passed over. The names of these writers guarantee the value of their contributions.

32. In this class of *Mixed Sciences* a novel feature is exhibited in the Sixth Volume of the series, viz., *A Systematic Account of the* ARTS *and* MANUFACTURES *of Great Britain.* There is probably no writer who would be able to do such ample justice to so extensive a range of matter, requiring both theoretical and practical knowledge, as its author, Mr. Barlow; but that nothing might be wanting to the completeness of this portion of the work, Professor Babbage supplied a Preliminary Discourse on the *Principles of Manufactures;* and it may confidently be asked, to what other source could the conductors of the work have appealed with equal confidence on so difficult and multifarious a subject?

HISTORICAL DIVISION.

33. It is not possible, in this rapid sketch, to specify all the papers in this portion of the work; but as nearly every contribution is assigned to its proper author at the beginning of each volume, such a course is unnecessary either for the information of the public, or as a tribute of respect to the distinguished authors themselves. Ample care has been taken to enlist among the contributors to this department writers not only of splendid endowments, but also of the highest attainments in different classes of historical knowledge. There will be found among the numerous writers in this division contributions from Bishop Blomfield, Dr. Whewell, Mr. Justice Talfourd, Dr. Arnold, Dean Hinds, Rev. J. A. Jeremie, Rev. G. C. Renouard, Rev. J. H. Newman, Bishop Russell, Archdeacon Hale, Dean Lyall, Rev. J. B. S. Carwithen, Bishop Hampden, Rev. R. Garnet, Major Mountain, Rev. J. H. B. Mountain, Captain Procter, Rev. J. E. Riddle, Archdeacon Ormerod, T. Roscoe, Esq., W. Macpherson, Esq., Rev. R. L. Browne, Rev. H. Thomson, Rev. J. G. Dowling, Rev. J. W. Blakesley, Rev. J. B. Ottley, W. Lowndes, Esq., Q.C.

34. A good work on General History has long been a great desideratum in our literature. The summaries of Tytler and Russell are too brief, and the Universal History, independently of the heavy manner in which it is written, is too long. It is presumed that the Historical Volumes of the *Encyclopædia Metropolitana* will be found to meet this want in an efficient manner. They are written by men of undoubted ability; they exhibit the history of the world at first in a series of biographical sketches, and then in a continuous history of each remarkable country, combined with an Ecclesiastical History remarkably full and rich in the most interesting epochs of the Christian Church. Dissertations of great importance in a

philosopnical point of view, such as those on Ancient Philosophy and Literature, on the Crusades, the Feudal System, and the Scholastic System, are introduced into the text at the most convenient periods, for the illustration of the respective subjects.

MISCELLANEOUS PORTION.

35. Although the *Miscellaneous Division* of this *Encyclopædia* occupies a larger number of volumes than any other, it requires a less extended notice. It appears, however, desirable to explain in some degree the *principle* on which this portion of the work was executed, and to indicate the authors of some of the most remarkable series of papers.

The leading features in this division of the *Encyclopædia* are—

1. The English Lexicon.
2. The Geography.
3. The Natural History.
4. The Miscellaneous Articles.

The universal approbation with which the Lexicon, compiled by Dr. Richardson, has been received, precludes the necessity of enlarging either on the plan itself or on the gigantic labour involved in its execution. The plan of giving the quotations of each word *chronologically* has the advantage of embodying in a philosophical Lexicon a *History of our own Language.*

36. For the whole of the Articles on Geography, the proprietors feel that they may fairly advance the claim of having obtained the co-operation of persons more than competent to bring forward whatever is most valuable for a work like this from all usually accessible sources of information. In this respect, the *Encyclopædia Metropolitana* claims to take a high station among similar works; and the names of the contributors of the Articles on *European* and *American Geography* are a sufficient pledge of the ability and care with which they are executed, viz.:—T. Myers, Esq., Captain Bonnycastle, R.E., C. Vignoles, Esq., C.E., H. Lloyd, Esq., G. H. Smith, Esq., A. Jacob, Esq., W. D. Coolie, Esq., and Cyrus Redding, Esq.

One class of Geographical Articles demands especial mention, and may be said to be wholly without a rival in any similar work in our language, viz.: those on *Ancient, Oriental,* and *African Geography,* which were entirely supplied by the Rev. G. C. Renouard (of Cambridge, formerly Chaplain at Smyrna), and evince the most extensive familiarity with every variety of language, ancient and modern. The Editor believes that if these essays were collected together, and published as a system of Oriental Geography, they would surpass in accuracy and value anything at present existing in our own or any other European language.

37. The section of Natural History is divided chiefly into *Botany* and *Zoology.* In these two sciences the *Genera* will be found described in their alphabetical order, while their scientific arrangement and the principles of the sciences form part of the treatises in the volumes devoted to the *Mixed Sciences.* For these two departments, the services of several eminent naturalists were engaged. In *Botany,* T. Edwards, Esq., and G. Don, Esq., &c. In *Zoology,* T. Bell, Esq., F.L.S., &c., J. E. Gray, Esq., F.L.S., &c., of the British Museum; J. F. Stephens, Esq., and J. F. South, Esq.

38. The highly-gifted individual to whom this Encyclopædia owes so many of its attractions—the late Rev. Edward Smedley,—enriched the Miscellaneous Division with a series of articles which embody a vast store of curious and recondite information, communicated in a manner at once instructive and agreeable. Besides these articles, the *Geographical Gazetteer* and the *Dictionary* of *Law* and *Political Philosophy,* a large number of very important and valuable articles will be found scattered through the volumes of the *Miscellaneous Division.* Attention may be called, amongst a variety of others, to the *Biblical Articles,* by the Rev. T. H. Horne; to the *Philological* and *Oriental,* by the Rev. G. C. Renouard; the *Scientific Articles,* (as *e. g., Dialling, Surveying, Weights and Measures, &c.*) by Mr. Barlow; *Meteoric Stones,* by Professor Miller; *Stove and Ventilation,* by C. Hood, Esq., F.R.S.; *Stucco,* by T. L. Donaldson, Professor of Architecture in University College, London; the *Theological Articles,* by Archdeacon Hale; Essays on *Engineering,* by C. Vignoles, Esq., C. E.; and *Writing,* by the Rev. R. Garnet.

The Plates are for the most part the work of those two eminent engravers,

Messrs. Lowry. They require only a simple inspection to prove their beauty and excellence.

The GENERAL INDEX was, at an early period in the publication of the *Encyclopædia*, intrusted to the Rev. J. Hindle, and occupied the attention of this very competent person for several years. It will be found to contain ample reference to all that is most important and interesting.

From this review of the FIRST EDITION of the Encyclopædia Metropolitana, we proceed to describe the peculiarities of the projected SECOND EDITION.

39. THE SECOND EDITION of the ENCYCLOPÆDIA METROPOLITANA will be handsomely printed in a series of CABINET VOLUMES, in CROWN OCTAVO, in the style shown by the SPECIMENS on pages 14 and 15.

40. The whole work will be THOROUGHLY REVISED; many NEW TREATISES will be added; and the Articles will all be provided with comprehensive INDEXES, or with analytical TABLES of CONTENTS.

41. It will be abundantly illustrated by Maps, Woodcuts, and Engravings.

42. It will be published in WEEKLY PARTS, PRICE ONE SHILLING, and in MONTHLY VOLUMES, varying in price according to the number of Parts contained in each.

43. METHODICAL ARRANGEMENT OF THE SECOND EDITION.—In preparing the SECOND EDITION of this Encyclopædia for publication, very little change will be made in its SYSTEM. The peculiar characteristic impressed upon it by Mr. Coleridge—ITS METHODICAL ARRANGEMENT—will be followed strictly. Indeed, the chief difference that will appear between the arrangement of the Second Edition and the First, will proceed from a more rigid adherence in the Second Edition to the *principles of Method* established by Mr. Coleridge, than it was possible to attain in the First Edition. The work being wholly original and composed by more than a hundred Contributors, it happened, during the first publication, that many of the articles, either because they were not produced in proper time to be incorporated in their systematic places, or for other unexplained reasons, were cast into the great "*Alphabetical, Miscellaneous, or Supplementary Division*," where they are connected together by no stronger scientific bond than their alphabetical initials. But now that we have the whole work before us, complete (as respects the First Edition), and capable of re-arrangement, we propose to rectify these accidental departures from the true method of the Encyclopædia, and to transfer, from the Alphabetical Miscellany, every article that is capable of transference, to its appropriate position in the Philosophical Classification. Thus, the Article GEOGRAPHY, properly organized, will form a new division, complementary to that on History, as was originally intended, see § 8; the details of NATURAL HISTORY will be grouped with the General Treatise on that science; the art of Diplomacy will be subjoined to the science of the Law of Nations; and so on. What remains in the Alphabetical Division, after this effective re-arrangement has been made, will form a SERIES of DICTIONARIES, Lexicographical, Classical, Theological, Technological, &c.

44. REVISION AND ENLARGEMENT.—Though the changes contemplated in the *General System* of the Encyclopædia are not important, the improvements to be made in the *details* will be considerable. In all possible cases, before the articles are reprinted for the Second Edition, they will be thoroughly revised, either by their authors or other competent persons, and Indexes and Tables of Contents will be added; the Historical series will be completed and re-arranged; the Treatises on the Natural and Experimental Sciences will either receive important amendments,

or be replaced by others entirely new; while the Mechanical and Chemical Arts, and the applications of the sciences to affairs of public utility, will be treated of in the Second Edition, much more practically than they were in the First Edition.

45. PROPOSED EXTENT OF THE WORK.—The series of scientific and historical TREATISES on the important SUBJECTS comprehended in the philosophical scheme of this work (page 13), which form indispensable links of the great chain of human knowledge—the Series necessary to complete the *circumference* of an Encyclopædia—cannot be compressed into *fewer* than EIGHTY CABINET VOLUMES. That is the *minimum* extent. But since the methodical plan of the work, as developed in this Prospectus, will permit at all times of the incorporation of such additional Treatises, as may be requisite to keep its scientific principles and historical facts in accordance with the progress of the age,—a permission of which the conductors will freely avail themselves,—it is impossible to state what may be the *maximum* number of its volumes. An Encyclopædia intended to reflect always the existing state of human knowledge, "to act," (in the language of Mr. COLERIDGE,) "at once as a reservoir and a fountain,—to receive perpetual accessions of knowledge from the genius of the age, and to yield the knowledge again in willing abundance," —such a work can never be effectually "*completed.*" That word applies with as little propriety to such an Encyclopædia, as it does to the Times Newspaper or the Philosophical Transactions; for, like those celebrated journals, this Encyclopædia will be at all times ready to incorporate an account of every important Event and new Principle that Time and Discovery may furnish, and for which its philosophical system provides an adequate Repository.

46. IMPROVED PLAN OF PUBLICATION.—A great alteration, and, it is hoped, an important improvement, will be made in the METHOD OF PUBLISHING the Second Edition, as contrasted with the method adopted for the first edition of this Encyclopædia. The PARTS of the CABINET EDITION will not, like the Parts of the Quarto Edition, contain letter-press and engravings belonging to different subjects or different Divisions of the Encyclopædia, forming a heterogeneous and unreadable mixture of fragments of many Treatises; but *each* PART will relate only to *one subject;* and whenever it is possible, *each* VOLUME of the CABINET EDITION will embrace ALL that relates to one subject. That, however, will necessarily depend upon the nature of the Subjects and the consequent extent of the Treatises. Very frequently several will be comprised in one Volume, and occasionally an important subject,—the principles of a leading Science, or the History of a great nation,—will occupy two volumes. But care will be taken to ensure a due proportion in size among the several Treatises, to avoid unnecessary prolixity, to combine comprehensiveness in matter with convenience in form, and to avoid the incongruous binding together of Treatises on irrelative Subjects—such, for example, as occurred in Vol. 5 of the First Edition, where the Treatises on the FINE ARTS were combined with two profound MATHEMATICAL TREATISES belonging to the Department of ASTRONOMY.

47. ADVANTAGES TO THE SUBSCRIBERS.—Those who subscribed to the original edition, and who remember how it was contrived to convert the most *Methodical* of Encyclopædias into the most *Immethodical* of Publications, will readily recognise the importance of an alteration, which INSURES TO THE SUBSCRIBER TO THE SECOND EDITION the possession of a complete readable portion of the work in recompense for every Subscription he is required to make.

48. ORDER OF PUBLICATION.—It seems not unnecessary to call the attention of intending Subscribers to the difference that exists between the *order* in which the SUBJECTS *occur* in the general system of this Encyclopædia and the *order* in which it may be *advisable to publish* the TREATISES on those subjects. In consequence of the different amount of corrections that will be required by the various Treatises that compose the Encyclopædia, and the circumstance that many Treatises on subjects that demand extensive investigation must be written entirely anew,—it would be impossible, without submitting to great delay and irregularity, to publish the revised Articles and new Treatises in Weekly Parts, in the exact order in which the subjects occur in Mr. Coleridge's methodical plan. Neither is it desirable

to adhere to that order pertinaciously, because it would not be agreeable to the great body of the SUBSCRIBERS to so comprehensive a work as this ENCYCLOPÆDIA, to receive, for months together, a series of WEEKLY PARTS relating solely to Mathematics, or to Geography, or to History, or indeed to *any* Department, in its order—*all other subjects being, for the time, systematically excluded.* A proceeding of that sort could hardly fail to excite dislike or indifference to the work in the FAMILIES of many of the SUBSCRIBERS. The Proprietors consider, therefore, that they will consult the general convenience, both of the Authors and the Subscribers, by publishing the Treatises in an indeterminate order,—giving History, Science, and Art alternately, but carefully indicating on the title-page of each Volume its exact place in the entire System, in accordance with the Plan given in page 13. In order, however, to prevent mistakes, every PART and VOLUME of the work, *as published*, will be marked with a running Number, simply to indicate the order of Publication, and irrespective of the ultimate Philosophical Arrangement of the articles. The Parts that constitute a Volume will be published as near together as circumstances permit, and, from time to time, General Title Pages and Tables of Contents will be supplied, to complete the Volumes of the several Divisions.

49. REGULARITY OF PUBLICATION.—The vast amount of original writing of the highest class, in every department of literature and science, which is comprehended in the First Edition of this Encyclopædia, and the proved excellence of its methodical plan, will so greatly facilitate the preparation of the CABINET EDITION, that the Conductors trust to be enabled to issue the WEEKLY PARTS in uninterrupted succession,—correcting in the work, as they go on, what requires correction; retrenching what is superfluous; and supplying what is deficient; so as to bring the whole more strictly into accordance with Mr. COLERIDGE'S great idea of the essentials of an Encyclopædia, and producing, if possible, a "SYSTEM OF UNIVERSAL KNOWLEDGE," more philosophical in its plan, more ably executed in its details, more convenient in size, and more economical in price, than any work of the kind that has ever hitherto been produced.

50. We conclude this Prospectus with a short extract from the Preface to the First Edition of the Encyclopædia:—

"The foregoing enumeration of the principal parts of the Encyclopædia embodies all the observations which the Editor considers it necessary to make in recommending the work to the patronage of the public. The exertions made by the Proprietors to procure the just fulfilment of the high expectations formed of the work, and of the promises they had made, as well as the perseverance with which they have conducted this important publication to its completion, amidst the many obstacles which must necessarily arise in so extensive an undertaking, entitle them to high consideration from that portion of the Public which is interested in works of a sterling and substantial character. From the present position of Literature, and *the system now in fashion of publishing small and superficial works which may be cheaply produced, and are really of no intrinsic value*, it is probable that a long period must elapse before any similar undertaking will be entered upon, from the enormous outlay of capital it requires, and the uncertainty of remuneration which it offers. It is hoped, therefore, that this GREAT NATIONAL WORK, for such it really is, may meet with that patronage which the Proprietors feel confident it fairly and fully deserves. They feel assured that, whether it be viewed as a whole or in its separate divisions, *it embodies a mass of information at once extensive, accurate, and scientifically arranged, which must place it in a pre-eminent and triumphant position.* Whatever its measure of success may be in a pecuniary point of view, they may justly feel a high gratification in having been instrumental, under Providence, in bringing to a successful termination *a work which, whether its* LITERARY MERIT OR THE SOUNDNESS OF ITS MORAL AND RELIGIOUS VIEWS *be regarded, must ever be considered as an* INESTIMABLE BENEFIT TO THEIR COUNTRY AND A PERMANENT ORNAMENT TO ITS LITERATURE."

London, October, 1849.

PLAN OF THE ENCYCLOPÆDIA METROPOLITANA.

The INTRODUCTION.—On the Laws and regulative Principles of EDUCATION; or in the Language of the Schools, the Elements of METHODOLOGY.

FIRST DIVISION.

PURE SCIENCES.

Section I. Formal Sciences.

Philosophy of Language.
Logic.
Rhetoric.
Mathematics:—
- Geometry.
- Arithmetic.
- Algebra.
- Geometrical Analysis.
- Theory of Numbers.
- Trigonometry.
- Analytical Geometry.
- Conic Sections.
- Differential and Integral Calculus.
- Calculus of Variations.
- Calculus of Finite Differences.
- Calculus of Functions.
- Theory of Probabilities.
- Definite Integrals.

Section II.—Real Sciences.

Moral and Metaphysical Philosophy.
Law:—
- General Principles of Law.
- Roman Law.
- English Law—
  - Laws of England.
  - Laws of Ireland.
  - Laws of Scotland.
  - Colonial Law.
- Canon Law.

Politics:—
- Law of Nations—Diplomacy.
- Political Philosophy—Statistics.
- Political Economy—Commerce.

Theology:—
- Natural Theology.
- Evidences of Revelation.
- Scripture Doctrine.
- Biblical Literature.
- Biblical Antiquities.
- Religions and Religious Customs.

SECOND DIVISION.

MIXED AND APPLIED SCIENCES.

Section I. Mechanical Philosophy. (*Mixed Mathematics*).

Mechanics.
Hydrostatics.
Pneumatics.
Optics.
Astronomy:—
- Plane Astronomy.
- Nautical Astronomy.
- Physical Astronomy.

Figure of the Earth.
Tides and Waves.

Section II. Experimental Philosophy.

Magnetism.
Electro-Magnetism.
Electricity.
Galvanism.
Heat.
Light.
Chemistry.
Sound.
Meteorology.

Section III.—The Fine Arts.

Architecture.
Sculpture.
Painting.
Heraldry.
Numismatics.
Poetry.
Music.
Engraving.

Section IV. The Useful Arts.

Agriculture.
Horticulture.
Floriculture.
Arboriculture.
Carpentry and Joinery.
Fortification.
Engineering.
Naval Architecture.
Manufactures.
Mechanical Arts.
Chemical Arts.

Section V. Natural History.

Inanimate:—
- Crystallography.
- Mineralogy.
- Geology.

Insentient:—
- Botany.

Animate:—
- Zoology.
- Physiology.
- Comparative Anatomy.
- Vertebrals:
  - Mammalia. | Reptiles.
  - Birds. | Fishes.
- Invertebrals:
  - Molluscs. | Spined Skins
  - Insects. | Sea Nettles.
  - Crustaceans. | Infusories.
  - Arachnidans. | Polyps.
  - Myriapods.

Section VI.—Applications of Natural History.

Anatomy.
Materia Medica.
Pharmacy.
Medicine.
Surgery.
Veterinary Art.

THIRD DIVISION.

HISTORY AND BIOGRAPHY.

Introduction:—
- On the Uses of History.
- Chronology.
- Chronological Tables.

Archæology.

Ethnology.

Ancient History:—
- Sacred History.
- The Jews.
- Greece.
- Greek Literature.
- Greek Philosophy and Art.
- Ancient Oriental Nations.
- Rome.
- Roman Literature.
- Roman Philosophy.
- Classical Antiquities.
- Heathen Mythology.

Middle Ages.

Modern History:—
- The Christian Church.
- Greek Empire.
- Ottoman Empire.
- The Crusades.
- Italy.
- Germany.
- France.
- Spain.
- Portugal.
- Netherlands.
- Switzerland.
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- India.

FOURTH DIVISION.

GEOGRAPHY.

Physical Geography.

Political Geography:—
- European.
- American.
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FIFTH DIVISION.

LEXICOGRAPHICAL.

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See Prospectus, § 43.

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derived from them the greatest encouragement to carry on the war against Darius, not doubting but that he was the person described in the prophetic books.

Alexander's favour to the Jews.

At his departure these circumstances so effectually recommended the Jews to the favour of Alexander, that when they petitioned him to allow them to live under their own laws, and in the free exercise of their religion, and further to be exempted from tribute every seventh year, because their law forbade them to cultivate the soil in the year of the sabbath, he immediately complied with their request. The Jews further implored his protection for their brethren whom he would find settled in Babylon; and many of them, won by his kindness, enlisted as soldiers in his service, and accompanied him on his expedition.

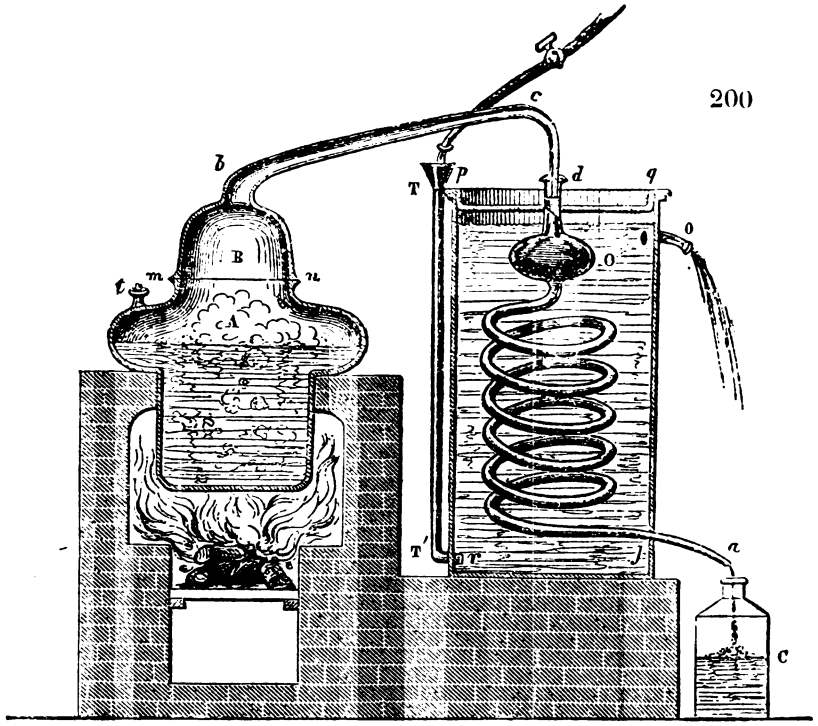
His behaviour to the Samaritans.

The Samaritans envying the Jews the favour they had so unexpectedly gained, and jealous of the distinction conferred upon them, thought by a similar line of conduct to gain as much influence with the king. They met him as he returned from Jerusalem in a solemn religious procession, and professing their kindred with the Hebrews, sought from him a grant of the same privileges which he had given to their brethren. Alexander excused himself from paying attention to their request till after his return from Egypt; but, during his absence, a rebellion taking place in the city, in which Andromachus, the governor, perished, at his return he caused all those who were concerned in the disturbance to be put to death, and driving out the Samaritans, planted their city with Macedonians: those who survived retired to Shechem, under Mount Gerizim, which from that time became the metropolis of the Samaritan sect, and continues so to this day. The eight thousand Samaritans who had joined Alexander at Tyre, and had been with him ever since, he settled in Thebais, the remotest province of Egypt, lest their presence in Samaria should revive the mutinous spirit of their countrymen. This treatment contrasts strikingly with that which the Jews subsequently received, for when Alexandria was built, he settled therein many of that nation, giving them great privileges, and allowing them not only the use of their own laws and religion, but also the enjoyment of equal franchises and liberties with his own people, the Macedonians.

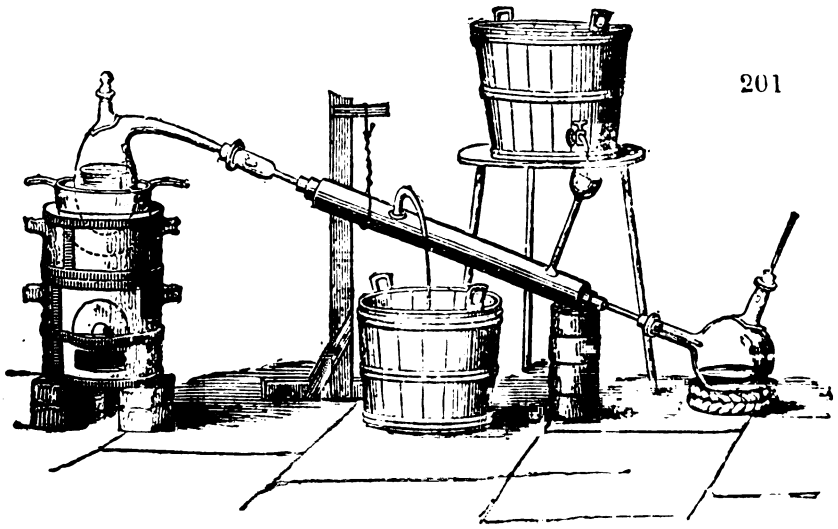
Influence of the preceding events upon Alexander's conduct.

It does not fall within our province to pursue the narration of Alexander's conquests, or to trace him in his rapid progress to the highest pinnacle of martial glory; one part, however, of his character is so closely connected with the occurrences related to have taken place on his arrival at Jerusalem, that we cannot forbear stopping to direct the reader's attention to it. It has often created surprise that a man of Alexander's strength of mind, should have been guilty of such folly and weakness as to feign himself to be the son of Jupiter Ammon, and to undertake a most laborious expedition to his Temple, which was situated in the midst of the deserts of Lybia, and twelve days journey from Memphis, for no other purpose than that of procuring himself the title of son of Jupiter.

The water to be distilled is poured into the Still at the opening marked *t*. The water of the Condenser is continuously renewed by the supply-pipe T T′, and when heated by the steam, it is suffered to run off by the escape-pipe *o*.



It is frequently necessary, in the laboratory, to distil volatile liquors, in which case the condensing power must be very effective, that loss be not occasioned by the escape of uncondensed vapour. For such operations, the apparatus represented by fig. 201 is employed. The



liquor to be distilled is placed in a glass Retort, the neck of which is connected, by means of an adapter, to a straight Condenser, consisting

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The PLAN and the LITERARY MERITS of the Encyclopædia Metropolitana have been sufficiently dwelt upon in the PROSPECTUS. After twenty-eight years of arduous labour, the work was completed in 1845. The expenditure upon it amounted to £26,000 for authorship, £7000 for designing and engraving the Plates, and £11,000 for stereotyping the letter-press, a total of £44,000, exclusive of the cost of paper, printing, binding, and publishing. These facts are cited to show how earnestly the Proprietors endeavoured to do justice to their undertaking The work contains 23,000 quarto pages of letter-press, and above 600 quarto engravings by Lowry, of great beauty and accuracy; the whole forming Thirty large Volumes. The original form of publication was in 59 Parts, at 21*s*. each.

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The ORIGINAL SUBSCRIBERS to this work, who have not yet completed their Sets, have still the opportunity of doing so—but the sale of the Original Parts will very shortly be discontinued.

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PROJECTED BY SAMUEL TAYLOR COLERIDGE.

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by
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1849.

Mar

LOGIC.

By RICHARD WHATELY, D.D.

ARCHBISHOP OF DUBLIN.

REPRINTED FROM THE ORIGINAL EDITION.

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* The author of the Treatise on LOGIC is not accountable for the contents of this SYNOPSIS.—EDITOR ENCY. MET.

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LOGIC.

INTRODUCTORY SECTION.

Logic, in the most extensive sense which it can with propriety be made to bear, may be considered as the Science and also as the Art of Reasoning. It investigates the principles on which argumentation is conducted, and furnishes rules to secure the mind from error in its deductions. Its most appropriate office, however, is that of instituting an analysis of the process of the mind in Reasoning: and in this point of view it is, as has been stated, strictly a Science: while considered in reference to the practical rules above mentioned, it may be called the Art of Reasoning. This distinction, as will hereafter appear, has been overlooked, or not clearly pointed out by most writers on the subject, Logic having been in general regarded as merely an Art; and its claim to hold a place among the Sciences having been expressly denied.

Considering how early Logic attracted the attention of philosophers, it may appear surprising that so little progress should have been made, as is confessedly the case, in developing its principles, and perfecting the detail of the system: and this circumstance has been brought forward as a proof of the barrenness and futility of the study. But a similar argument might have been urged with no less plausibility, in past ages, against the study of Natural Philosophy, and very recently against that of Chemistry. No Science can be expected to make any considerable progress, which is not cultivated on right principles. Whatever may be the inherent vigour of the plant, it will neither be flourishing nor fruitful till it meet with a suitable soil and culture: and in no case is the remark more applicable than in the present; the greatest mistakes having always prevailed respecting the nature of Logic, and its province having in consequence been extended by many writers to subjects with which it has no proper connection. Indeed, with the exception of Aristotle, (who is himself not entirely exempt from the errors in question,) hardly a writer on Logic can be mentioned who has clearly perceived, and steadily kept in view throughout, its real nature and object. Before his time, no distinction was drawn between the Science of which we are speaking, and that which is now usually called Metaphysics: a circumstance which alone shows how small was the progress made in earlier times. Indeed those who first turned their attention to the

subject, hardly thought of inquiring into the process of Reason itself, but confined themselves almost entirely to certain preliminary points, the discussion of which is (if logically considered) subordinate to that of the main inquiry.

Zeno the Eleatic, whom most accounts represent as the earliest systematic writer on the subject of Logic, or as it was then called, Dialectics, divided his work into three parts; the first of which (upon Consequences) is censured by Socrates [Plato, *Parmen.*] for obscurity and confusion. In his second part, however, he furnished that interrogatory method of disputation [ἐρώτησις] which Socrates adopted, and which has since borne his name. The third part of his work was devoted to what may not improperly be termed the art of wrangling, [ἐριστικὴ] which supplied the disputant with a collection of sophistical questions, so contrived that the concession of some point which seemed unavoidable, immediately involved some glaring absurdity. This, if it is to be esteemed as at all falling within the province of Logic, is certainly not to be regarded (as some have ignorantly or heedlessly represented it) as its principal or proper business. The Greek philosophers generally have unfortunately devoted too much attention to it: but we must beware of falling into the vulgar error of supposing the ancients to have regarded as a serious and intrinsically important study, that which in fact they considered as an ingenious recreation. The disputants diverted themselves in their leisure hours by making trial of their own and their adversary's acuteness, in the endeavour mutually to perplex each other with subtle fallacies; much in the same way as men amuse themselves with propounding and guessing riddles, or with the game of chess; to each of which diversions the sportive disputations of the Ancients bore much resemblance. They were closely analogous to the wrestling and other exercises of the gymnasium, these last being reckoned conducive to bodily vigour and activity, as the former were to habits of intellectual acuteness; but the *immediate* object in each was a sportive, not a serious contest; though, doubtless, fashion and emulation often occasioned an undue importance to be attached to success in each.

Zeno then is hardly to be regarded as any further a logician than as to what respects his erotetic method of disputation; a course of argument constructed on this principle being properly an hypothetical sorites, which may easily be reduced into a series of syllogisms.

To Zeno succeeded Euclid of Megara, and Antisthenes, both pupils of Socrates. The former of these prosecuted the subject of the third part of his predecessor's treatise, and is said to have been the author of many of the fallacies attributed to the Stoical school. Of the writings of the latter, nothing certain is known: if, however, we suppose the above mentioned sect to be his disciples in this study, and to have retained his principles, he certainly took a more correct view of the subject than Euclid. The Stoics divided all λεκτὰ, every thing that

could be said, into three classes: 1st, the simple term; 2d, the proposition; 3d, the syllogism; *viz.* the *hypothetical;* for they seem to have had little notion of a more rigorous analysis of argument than into that familiar form.

We must not here omit to notice the merits of Archytus, to whom we are indebted for the doctrine of the categories. He, however, (as well as the other writers on the subject,) appears to have had no distinct view of the proper object and just limits of the science of Logic; but to have blended with it Metaphysical discussions not strictly connected with it, and to have dwelt on the investigation of the nature of terms and propositions, without maintaining a constant reference to the principles of Reasoning, to which all the rest should be made subservient.

The state then in which Aristotle found the Science, (if indeed it can properly be said to have existed at all before his time,) appears to have been nearly this: the division into simple terms, propositions and syllogisms, had been slightly sketched out; the doctrine of the categories, and perhaps that of the opposition of propositions, had been laid down; and, as some believe, the analysis of species into genus and differentia, had been introduced by Socrates. These, at best, were rather the materials of the system, than the system itself; the foundation of which, indeed, he distinctly claims the merit of having laid; and which remains fundamentally the same as he left it.

It has been remarked that the Logical system is one of those few theories which have been begun and perfected by the same individual. The history of its discovery, as far as the main principles of the science are concerned, properly commences and ends with Aristotle. And this may perhaps in part account for the subsequent perversions of it. The brevity and simplicity of its fundamental truths, (to which indeed all real science is perpetually tending,) has probably led many to suppose that something much more complex, abstruse, and mysterious, remained to be discovered. The vanity by which all men are prompted unduly to magnify their own pursuits, has led unphilosophical minds, not in this case alone, but in many others, to extend the boundaries of their respective Sciences, not by the patient development and just application of the principles of those Sciences, but by wandering into irrelevant subjects. The mystical employment of numbers by Pythagoras, in matters utterly foreign to Arithmetic, is perhaps the earliest instance of the kind. A more curious and important one is the degeneracy of Astronomy into judicial Astrology; but none is more striking than the misapplication of Logic, by those who have treated of it as "the art of rightly employing the rational faculties," or who have intruded it into the province of Natural Philosophy, and regarded the syllogism as an engine for the investigation of nature: overlooking the boundless field that was before them within the legitimate limits of the Science; and not perceiving

the importance and difficulty of the task of completing and properly filling up the masterly sketch before them.

The writings of Aristotle were not only absolutely lost to the world for about two centuries, but seem to have been but little studied for a long time after their recovery. An Art, however, of Logic, derived from the principles traditionally preserved by his disciples, seems to have been generally known, and was employed by Cicero in his philosophical works; but the pursuit of the science seems to have been abandoned for a long time. Early in the Christian era, the Peripatetic doctrines experienced a considerable revival; and we meet with the names of Galen and Porphyry as Logicians: but it is not till the fifth century that Aristotle's Logical works were translated into Latin by the celebrated Boethius. Not one of these seems to have made any considerable advances in developing the Theory of Reasoning. Of Galen's labours little is known; and Porphyry's principal work is merely on the *predicables*. We have little of the Science till the revival of learning among the Arabians, by whom Aristotle's treatises on this as well as on other subjects were eagerly studied.

Passing by the names of some Byzantine writers of no great importance, we come to the times of the Schoolmen, whose waste of ingenuity and frivolous subtilty of disputation need not be enlarged upon. It may be sufficient to observe, that their fault did not lie in their diligent study of Logic, and the high value they set upon it, but in their utterly mistaking the true nature and object of the science; and by attempting to employ it for the purpose of physical discoveries, involving every subject in a mist of words, to the exclusion of sound philosophical investigation. Their errors may serve to account for the strong terms in which Bacon sometimes appears to censure Logical pursuits; but that this censure was intended to bear against the extravagant perversions, not the legitimate cultivation of the Science, may be proved from his own observations on the subject, in his *Advancement of Learning*.

His moderation, however, was not imitated in other quarters. Even Locke confounds in one sweeping censure the Aristotelic theory, with the absurd misapplications and perversions of it in later years. His objection to the Science, as unserviceable in the *discovery* of truth, (which has of late been often repeated) while it holds good in reference to many (misnamed) Logicians, indicates that with regard to the true nature of the science itself, he had no clearer notions than they have, of the proper province of Logic, *viz.* Reasoning; and of the distinct character of that operation from the observations and experiments which are essential to the study of nature.

An error apparently different, but substantially the same, pervades the treatises of Watts and other modern writers on the subject. Perceiving the inadequacy of the syllogistic theory to the vast purposes to which others had attempted to apply it, he still craved after

the attainment of some equally comprehensive and all-powerful system; which he accordingly attempted to construct, under the title of *The Right Use of Reason;* which was to be a method of invigorating and properly directing all the powers of the mind: a most magnificent object indeed, but one which not only does not fall under the province of Logic, but cannot be accomplished by any *one* Science or System that can even be conceived to exist. The attempt to comprehend so wide a field is no extension of Science, but a mere verbal generalization, which leads only to vague and barren declamation. In every pursuit, the more precise and definite our object, the more likely we are to attain some valuable result; if, like the Platonists, who sought after the αὐτάγαθον, the abstract idea of good, we pursue some specious but ill-defined scheme of universal knowledge, we shall lose the substance while grasping at a shadow, and bewilder ourselves in empty generalities.

It is not perhaps much to be wondered at, that in still later times several ingenious writers, forming their notions of the Science itself from professed masters in it, such as have just been alluded to, and judging of its value from their failures, should have treated the Aristotelic system with so much reprobation and scorn. Too much prejudiced to bestow on it the requisite attention for enabling them clearly to understand its real character and object, or even to judge correctly from the little they did understand, they have assailed the study with a host of objections, so totally irrelevant, and consequently impotent, that, considering the talents and general information of those from whom they proceed, they might excite astonishment in any one who did not fully estimate the force of very early prejudice.

Logic has usually been considered by these objectors as professing to furnish a peculiar method of Reasoning, instead of a method of analyzing that mental process which must *invariably* take place in all correct Reasoning; and accordingly they have contrasted the ordinary mode of reasoning with the syllogistic; and have brought forward with an air of triumph the argumentative skill of many who never learned the system: a mistake no less gross than if any one should regard Grammar as a peculiar language, and contend against its utility on the ground that many speak correctly who never studied the principles of Grammar; whereas Logic, which is, as it were, the Grammar of Reasoning, does not bring forward the regular syllogism as a distinct mode of argumentation, designed to be substituted for any other mode; but as the form to which all correct Reasoning may be ultimately reduced, and which consequently serves the purpose (when we are employing Logic as an Art) of a test to try the validity of any argument, in the same manner as by chemical analysis we develop and submit to a distinct examination the elements of which any compound body is composed, and are thus enabled to detect any latent sophistication and impurity.

Complaints have also been made that Logic leaves untouched the greatest difficulties, and those which are the sources of the chief errors in Reasoning; *viz.* the ambiguity or indistinctness of terms, and the doubts respecting the degrees of evidence in various propositions: an objection which is not to be removed by any such attempt as that of Watts to lay down "rules for forming clear ideas, and for guiding the judgment;" but by replying that no Art is to be censured for not teaching more than falls within its province, and indeed more than can be taught by any conceivable art. Such a system of universal knowledge as should instruct us in the full meaning of every term, and the truth or falsity, certainty or uncertainty, of every proposition, thus superseding all other studies, it is most unphilosophical to expect or even to imagine. And to find fault with Logic for not performing this, is as if one should object to the Science of Optics for not giving sight to the blind; or as if (like the man of whom Warburton tells a story in his *Div. Leg.*) one should complain of a reading glass for being of no service to a person who had never learned to read.

In fact, the difficulties and errors above alluded to are *not* in the process of Reasoning itself, (which alone is the appropriate province of Logic,) but in the subject matter about which it is employed. This process will have been correctly conducted if it have conformed to the Logical rules which preclude the possibility of any error creeping in between the principles from which we are arguing, and the conclusions we deduce from them. But still that conclusion may be false, if the principles we start from are so. In like manner, no Arithmetical skill will secure a correct result to a calculation, unless the data are correct from which we calculate; nor does any one on that account undervalue Arithmetic; and yet the objection against Logic rests on no better foundation.

There is in fact a striking analogy in this respect between the two Sciences. All numbers (which are the subject of Arithmetic) must be numbers *of some things*, whether coins, persons, measures, or any thing else; but to introduce into the Science any notice of the *things* respecting which calculations are made, would be evidently irrelevant, and would destroy its scientific characters: we proceed therefore with arbitrary signs representing numbers in the abstract. So also does Logic pronounce on the validity of a regularly constructed argument equally well, though arbitrary symbols may have been substituted for the terms, and consequently without any regard to the things signified by those terms. And the probability of doing this (though the employment of such arbitrary symbols has been absurdly objected to, even by writers who understood not only Arithmetic but Algebra) is a proof of the strictly scientific character of the system. But many professed Logical writers, not attending to the circumstances which have been just mentioned, have wandered into disquisitions on various

branches of knowledge; disquisitions which must evidently be as boundless as human knowledge itself, since there is no subject on which Reasoning is not employed, and to which consequently Logic may not be *applied*. The error lies in regarding every thing as the *proper province* of Logic, to which it is *applicable*. A similar error is complained of by Aristotle, as having taken place with respect to Rhetoric; of which indeed we find specimens in the arguments of several of the interlocutors in *Cic. de Oratore*.

From what has been said, it will be evident that there is hardly any subject to which it is so difficult to introduce the student in a clear and satisfactory manner, as the one we are now engaged in. In any other branch of knowledge, the reader, if he have any previous acquaintance with the subject, will usually be so far the better prepared for comprehending the exposition of the principles; or if he be entirely a stranger to it, will at least come to the study with a mind unbiassed, and free from prejudices and misconceptions; whereas in the present case it cannot but happen that many who have given some attention to Logical pursuits, (or what are usually considered as such) will frequently have rather been bewildered by fundamentally erroneous views, than prepared by the acquisition of just principles for ulterior progress; and that not a few who pretend not to any acquaintance whatever with the Science, will yet have imbibed either such prejudices against it, or such false notions respecting its nature, as cannot but prove obstacles in their study of it.

There is, however, a difficulty which exists more or less in all abstract pursuits, though it is perhaps more felt in this, and often occasions it to be rejected by beginners as dry and tedious; *viz.* the difficulty of perceiving to what ultimate end,—to what practical or interesting application the abstract principles lead which are first laid before the student; so that he will often have to work his way patiently through the most laborious part of the system before he can gain any clear idea of the drift and intention of it.

This complaint has often been made by chemical students, who are wearied with descriptions of oxygen, hydrogen, and other invisible elements, before they have any knowledge respecting such bodies as commonly present themselves to the senses. And accordingly some teachers of Chemistry obviate in a great degree this objection, by adopting the analytical instead of the synthetical mode of procedure, when they are first introducing the subject to beginners; *i.e.* instead of synthetically enumerating the elementary substances, proceeding next to the simplest combinations of these, and concluding with those more complex substances which are of the most common occurrence, they begin by *analyzing* these last, and resolving them step by step into their simple elements; thus presenting the subject at once in an interesting point of view, and clearly setting forth the object of it. The synthetical form of teaching is indeed sufficiently interesting to

one who has made considerable progress in any study; and being more concise, regular, and systematic, is the form in which our knowledge naturally arranges itself in the mind, and is retained by the memory: but the analytical is the more interesting, easy, and natural kind of introduction, as being the form in which the first invention or discovery of any kind of system must originally have taken place.

It may be advisable, therefore, to begin by giving a slight sketch, in this form, of the Logical system, before we enter regularly upon the details of it. The reader will thus be presented with a kind of imaginary history of the course of inquiry by which the Logical system may be conceived to have occurred to a philosophical mind.

In every instance in which we *reason*, in the strict sense of the word, *i.e.* make use of arguments, whether for the sake of refuting an adversary, or of conveying instruction, or of satisfying our own minds on any point, whatever may be the subject we are engaged on, a certain process takes place in the mind, which is one and the same in all cases, provided it be correctly conducted.

Of course it cannot be supposed that every one is even conscious of this process in his own mind, much less is competent to explain the principles on which it proceeds; which indeed is, and cannot but be, the case with every other process respecting which any system has been formed; the practice not only may exist independently of the theory, but must have preceded the theory; there must have been language before a system of Grammar could be devised; and musical compositions previous to the science of Music. This by the way will serve to expose the futility of the popular objection against Logic, that men may reason very well who know nothing of it. The parallel instance adduced, shows that such an objection might be applied in many other cases, where its absurdity would be obvious; and that there is no reason for deciding thence, either that the system has no tendency to improve practice, or that even if it had not, it might not still be a dignified and interesting pursuit.

One of the chief impediments to the attainment of a just view of the nature and object of Logic, is the not fully understanding, or not sufficiently keeping in mind, the SAMENESS of the Reasoning process in all cases; if, as the ordinary mode of speaking would seem to indicate, Mathematical Reasoning, and Theological, and Metaphysical, and Political, &c., were essentially different from each other, *i.e.* different *kinds of reasoning*, it would follow, that supposing there could be at all any such Science as we have described Logic, there must be so many different species, or at least different branches of Logic. And such is perhaps the most prevailing notion. Nor is this much to be wondered at; since it is evident to all that some men converse and write in an argumentative way, very justly on one subject, and very erroneously on another, in which again others excel, who fail in the former. This error may be at once illustrated and removed, by con-

sidering the parallel instance of Arithmetic, in which every one is aware that the process of a calculation is not affected by the nature of the objects whose numbers are before us: but that (*e.g.*) the multiplication of a number is the very same operation, whether it be a number of men, of miles, or of pounds; though nevertheless men may perhaps be found who are accurate in calculations relative to Natural Philosophy, and incorrect in those of Political Economy, from their different degrees of skill in the subjects of these two Sciences; not surely because there are different arts of Arithmetic applicable to each of these respectively.

Others again, who are aware that the simple system of Logic may be applied to all subjects whatever, are yet disposed to view it as a peculiar method of Reasoning, and not as it is, a method of unfolding and analyzing our Reasoning: whence many have been led (*e.g.* the author of the Philosophy of Rhetoric) to talk of comparing syllogistic Reasoning with moral Reasoning, and to take it for granted that it is possible to reason correctly without reasoning Logically; which is in fact as great a blunder as if any one were to mistake Grammar for a peculiar language, and to suppose it possible to speak correctly without speaking Grammatically. They have in short considered Logic as *an* Art of Reasoning; whereas, so far as it is an Art, it is *the* Art of Reasoning: the Logician's object being, not to lay down principles by which one *may* reason, but by which all *must* reason, even though they are not distinctly aware of them: to lay down rules, not which may be followed with advantage, but which cannot possibly be departed from in sound reasoning. These misapprehensions and objections being such as lie on the very threshold of the subject, it would have been hardly possible, without noticing them, to convey any just notion of the nature and design of the Logical system.

Supposing it then to have been perceived that the operation of Reasoning is in all cases the same, the analysis of that operation could not fail to strike the mind as an interesting matter of inquiry: and moreover, since (apparent) arguments which are unsound and inconclusive, are so often employed either *from* error or *from* design; and even those who are not misled by these fallacies, are so often at a loss to detect and expose them in a manner satisfactory to others, or even to themselves, it could not but appear desirable to lay down some general rules of Reasoning, applicable to all cases, by which a person might be enabled the more readily and clearly to state the grounds of his own conviction, or of his objection to the arguments of an opponent, instead of arguing at random without any fixed and acknowledged principles to guide his procedure. Such rules would be analogous to those of Arithmetic, which obviate the tediousness and uncertainty of calculations in the head, wherein, after much labour, different persons might arrive at different results, without any of them being able distinctly to point out the error of the rest. A system of such rules, it

is obvious, must, instead of deserving to be called the Art of wrangling, be more justly characterised as "the Art of cutting short wrangling," by bringing the parties to issue at once, if not to agreement, and thus saving a waste of ingenuity.

In pursuing the supposed investigation, it will be found that every conclusion is deduced, in reality, from two other propositions, (thence called premises;) for though one of these may be, and commonly is, suppressed, it must nevertheless be understood as admitted; as may easily be made evident by supposing the DENIAL of the suppressed premiss, which will at once invalidate the argument: *e.g.* if any one from perceiving that the world exhibits marks of design, infers that "it must have had an intelligent author," though he may not be aware in his own mind of the existence of any other premiss, he will readily understand, if it be denied that "whatever exhibits marks of design must have had an intelligent author," that the affirmative of that proposition is necessary to the validity of the argument. An argument thus stated regularly and at full length is called a Syllogism; which, therefore, is evidently not a peculiar *kind of argument*, but only a peculiar *form* of expression, in which every argument may be stated. When one of the premises is suppressed, (which for brevity's sake it usually is,) the argument is called an Enthymeme. And it may be worth while to remark, that when the argument is in this state, the objections of an opponent are (or rather appear to be) of two kinds; *viz.* either objections to the *assertion* itself, or objections to its *force* as an argument; *e.g.* in the above instance, an atheist may be conceived either denying that the world does exhibit marks of design, or denying that it *follows* from thence that it had an intelligent author. The only difference in the two cases is, that in the one the *expressed* premiss is denied, in the other the *suppressed;* for the *force as an argument* of either premiss depends on the other premiss: if both be admitted, the conclusion legitimately connected with them cannot be denied.

It is evidently immaterial to the argument whether the conclusion be placed first or last; but it may be proper to remark, that a premiss placed *after* its conclusion is called the *reason* of it, and is introduced by one of those conjunctions which are called causal; *viz.* "since," "because," &c. which may indeed be employed to designate a premiss, whether it came first or last; the illative conjunctions, "therefore," &c. designate the conclusion. It is a circumstance which often occasions error and perplexity, that both these classes of conjunctions have also another signification, being employed to denote, respectively, cause and effect, as well as premiss and conclusion: *e.g.* if I say, (to use an instance employed by Aristotle,) "yonder is a fixed star, *because* it twinkles," or, "it twinkles, and therefore is a fixed star," I employ these conjunctions to denote the connection of premiss and conclusion; for it is plain that the twinkling of the star is not the

cause of its being fixed, but only the cause of *my knowing* that it is so: but if I say, "it twinkles because it is a fixed star," or "it is a fixed star, and therefore twinkles," I am using the same conjunctions to denote the connection of cause and effect; for in this case the twinkling of the star, being evident to the eye, would hardly need to be *proved*, but might need to be accounted for. There are, however, many cases in which the cause is employed to *prove* the existence of its effect; especially in arguments relating to *future* events: the *cause* and the reason, in that case, coincide; and this contributes to their being so often confounded together in other cases. In an argument, such as the example above given, it is, as has been said, impossible for any one, who admits both premises, to avoid admitting the conclusion; but there will be frequently an apparent connection of premises with a conclusion which does not in reality follow from them, though to the inattentive or unskilful the argument may appear to be valid: and there are many other cases in which a doubt may exist whether the argument be valid or not; *i.e.* whether it be possible or not to admit the premises, and yet deny the conclusion. It is of the highest importance, therefore, to lay down some regular form to which every valid argument may be reduced, and to devise a rule which shall prove the validity of every argument in that form, and consequently the unsoundness of any apparent argument which cannot be reduced to it: *e.g.* if such an argument as this be proposed, "every rational agent is accountable; brutes are not rational agents; therefore they are not accountable:" or again, "all wise legislators suit their laws to the genius of their nation; Solon did this; therefore he was a wise legislator;" there are some, perhaps, who would not perceive any fallacy in such arguments, especially if enveloped in a cloud of words; and still more when the conclusion is true, or, which comes to the same point, if they are disposed to believe it; and others might perceive indeed, but might be at a loss to explain the fallacy. Now these (apparent) arguments exactly correspond respectively with the following, the absurdity of the conclusions from which is manifest: "every horse is an animal; sheep are not horses; therefore they are not animals:" and, "all vegetables grow; an animal grows; therefore it is a vegetable." These last examples, it has been said, correspond exactly (considered as arguments) with the former; the question respecting the validity of an argument being, not whether the conclusion be *true*, but whether it follows from the premises adduced. This mode of exposing a fallacy, by bringing forward a similar one whose conclusion is obviously absurd, is often, and very advantageously, resorted to in addressing those who are ignorant of Logical rules; but to lay down such rules, and employ them as a test, is evidently a safer and more compendious, as well as a more philosophical mode of proceeding. To attain these, it would plainly be necessary to analyze some clear and valid arguments, and to observe in what their conclu-

siveness consists. Let us suppose, then, such an examination to be made of the syllogism above mentioned: "whatever exhibits marks of design had an intelligent author."

The world exhibits marks of design; therefore the world had an intelligent author. In the first of these premises we find it assumed universally of the *class* of "things which exhibit marks of design," that they had an intelligent author; and in the other premiss, "the world" is referred to that class as comprehended in it: now it is evident, that whatever is said of the whole of a class, may be said of any thing comprehended in that class; so that we are thus authorized to say of the world, that it had an intelligent author. Again, if we examine a syllogism with a negative conclusion, as, *e.g.* "nothing which exhibits marks of design could have been produced by chance: the world exhibits, &c.; therefore the world could not have been produced by chance." The process of Reasoning will be found to be the same; since it is evident, that whatever is *denied* universally of any class, may be denied of any thing that is comprehended in that class.

On further examination it will be found, that all valid arguments whatever may be easily reduced to such a form as that of the foregoing syllogisms; and that consequently the principle on which they are constructed is the universal principle of Reasoning. So elliptical indeed is the ordinary mode of expression, even of those who are considered as prolix writers, *i.e.* so much is implied and left to be understood in the course of argument, in comparison of what is actually stated, (most men being impatient, even to excess, of any appearance of unnecessary and tedious formality of statement,) that a single sentence will often be found, though perhaps considered as a single argument, to contain, compressed into a short compass, a chain of several distinct arguments; but if each of these be fully developed, and the whole of what the author intended to imply be stated expressly, it will be found that all the steps even of the longest and most complex train of Reasoning, may be reduced into the above form.

It is a mistake (which might appear scarcely worthy of notice had not so many, even esteemed writers, fallen into it) to imagine that Aristotle and other Logicians meant to propose that this prolix form of unfolding arguments should universally supersede, in argumentative discourses, the common forms of expression; and that to reason Logically, means, to state all arguments at full length in the syllogistic form: and Aristotle has even been charged with inconsistency for not doing so; it has been said, that "in his *Treatises of Ethics, Politics,* &c., he argues like a rational creature, and never attempts to bring his own system into practice:" as well might a Chemist be charged with inconsistency for making use of any of the compound substances that are commonly employed, without previously analyzing and resolving them into their simple elements; as well might it be imagined that, to speak grammatically, means, to parse every sentence

we utter. The Chemist (to pursue the illustration) keeps by him his tests and his method of analysis, to be employed when any substance is offered to his notice, the composition of which has not been ascertained, or in which adulteration is suspected. Now a fallacy may aptly be compared to some adulterated compound; it consists of an ingenious mixture of truth and falsehood, so entangled, so intimately blended, that the falsehood is (in the chemical phrase) *held in solution:* one drop of sound Logic is that test which immediately disunites them, makes the foreign substance visible, and precipitates it to the bottom.

But to resume the investigation of the principles of Reasoning: the maxim resulting from the examination of a syllogism in the foregoing form, and of the application of which every valid argument is in reality an instance, is, "that whatever is predicated (*i.e.* affirmed or denied) universally, of any class of things, may be predicated in like manner, (*viz.* affirmed or denied,) of any thing comprehended in that class." This is the principle, commonly called the *dictum de omni et nullo,* for the establishment of which we are indebted to Aristotle, and which is the keystone of his whole Logical system. It is not a little remarkable that some, otherwise judicious writers, should have been so carried away by their zeal against that philosopher, as to speak with scorn and ridicule of this principle, on account of its obviousness and simplicity; though they would probably perceive at once, in any other case, that it is the greatest triumph of philosophy to refer many, and seemingly very various, phenomena to one, or a very few, simple principles; and that the more simple and evident such a principle is, provided it be truly applicable to all the cases in question, the greater is its value and scientific beauty. If, indeed, any principle be regarded as *not* thus applicable, *that* is an objection to it of a different kind. Such an objection against Aristotle's dictum, no one has ever attempted to *establish* by any kind of proof; but it has often been *taken for granted;* it being (as has been stated) very commonly supposed, without examination, that the syllogism is a *distinct kind of argument,* and that the rules of it do not apply, nor were intended to apply, to *all* Reasoning whatever. Under this misapprehension, Campbell (*Philosophy of Rhetoric*) labours, with some ingenuity, and not without an air of plausibility, to show that every syllogism must be futile and worthless, because the premises virtually assert the conclusion: little dreaming, of course, that his objections, however specious, lie against the *process of Reasoning itself* universally; and will therefore, of course, apply to those very arguments which he is himself adducing.

It is much more extraordinary to find another author (Dugald Stewart) adopting, expressly, the very same objections, and yet distinctly admitting within a few pages, the possibility of reducing every course of argument to a series of syllogisms.

The same writer brings an objection against the dictum of Aristotle,

which it may be worth while to notice briefly, for the sake of setting in a clearer light the real character and object of that principle. Its application being, as has been seen, to a regular and conclusive syllogism, he supposes it intended to prove and *make evident* the conclusiveness of such a syllogism; and remarks how unphilosophical it is to attempt giving a *demonstration of a demonstration.* And certainly the charge would be just, if we could imagine the Logician's object to be, to *increase the certainty* of a conclusion which we are supposed to have already arrived at by the clearest possible mode of proof. But it is very strange that such an idea should ever have occurred to one who had even the slightest tincture of Natural Philosophy: for it might as well be imagined that a Natural Philosopher or a Chemist's design to strengthen the testimony of our senses by *a priori* reasoning, and to convince us that a stone when thrown will fall to the ground, and that gunpowder will explode when fired, because they show that according to their principles those phenomena must take place as they do. But it would be reckoned a mark of the grossest ignorance and stupidity, not to be aware that their object is not to *prove* the existence of an individual phenomenon, which our eyes have witnessed, but (as the phrase is) to account for it: *i.e.* to show according to what *principle* it takes place;—to refer, in short, the *individual case* to a *general law* of nature. The object of Aristotle's dictum is precisely analogous: he had, doubtless, no thought of adding to the force of any individual syllogism; his design was to point out the *general principle* on which that process is conducted which takes place in each syllogism. And as the laws of nature (as they are called) are in reality merely *generalized facts*, of which all the phenomena coming under them are particular instances; so the proof drawn from Aristotle's dictum is not a distinct demonstration brought to confirm another demonstration, but is merely a generalized and abstract statement of *all* demonstration whatever; and is therefore in fact, *the very demonstration* which (*mutatis mutandis*) accommodated to the various subject matters, is actually employed in each particular case.

In order to trace more distinctly the different steps of the abstracting process, by which any particular argument may be brought into the most general form, we may first take a syllogism stated accurately and at full length, such as the example formerly given, "whatever exhibits marks of design, &c.," and then somewhat generalize the expression, by substituting (as in Algebra) arbitrary unmeaning symbols for the significant terms that were originally used; the syllogism will then stand thus: "every B is A; C is B; therefore C is A." The Reasoning is no less evidently valid when thus stated, whatever terms A, B, and C, respectively may be supposed to stand for: such terms may indeed be inserted as to make all, or any of, the assertions *false;* but it will still be no less impossible for any one who *admits* the truth of the *premises*, in an argument thus constructed, to

deny the conclusion; and this it is that constitutes the conclusiveness of an argument.

Viewing then the syllogism thus expressed, it appears clearly, that "A stands for *any thing whatever* that is predicated of a whole class," (*viz.* of *every* B) "which comprehends or contains in it *something else*," *viz.* C, of which B is, in the second premiss affirmed; and that consequently the first term (A) is, in the conclusion, predicated of the third C.

Now to assert the validity of this process, now before us, is to state the very dictum we are treating of with hardly even a verbal alteration, *viz.*:

1. Any thing whatever, predicated of a whole class,
2. Under which class something else is contained,
3. May be predicated of that which is so contained.

The three members into which the maxim is here distributed, correspond to the three propositions of the syllogism to which they are intended respectively to apply.

The advantage of substituting for the terms, in a regular syllogism, arbitrary unmeaning symbols such as letters of the alphabet, is much the same as in Mathematics: the Reasoning itself is then considered, by itself, clearly, and without any risk of our being misled by the truth or falsity of the conclusion, which are, in fact, accidental and variable; the essential point being, as far as the *argument* is concerned, the *connection between* the premises and the conclusions. We are thus enabled to embrace the general principle of all Reasoning, and to perceive its applicability to an indefinite number of individual cases. That Aristotle, therefore, should have been accused of making use of these symbols for the purpose of *darkening* his demonstrations, and that too, by persons not unacquainted with Geometry and Algebra, is truly astonishing. If a Geometer, instead of designating the four angles of a square, by four letters, were to call them *north*, *south*, *east*, and *west*, he would not render the demonstration of a theorem the easier; and the learner would be much more likely to be perplexed in the application of it.

It belongs then exclusively to a syllogism, properly so called, (*i.e.* a valid argument, so stated that its conclusiveness is evident from the mere *form* of the expression,) that if letters or any other unmeaning symbols be substituted for the several terms, the validity of the argument shall still be evident. Whenever this is not the case, the supposed argument is either unsound and sophistical, or else may be reduced, (without any alteration of its meaning) into the syllogistic form; in which form, the test just mentioned may be applied to it.

What is called an unsound or fallacious argument, *i.e.* an *apparent* argument which is, in reality, none, cannot, of course, be reduced into this form; but when stated in the form most nearly approaching to this that is possible, its fallaciousness becomes more evident, from its

nonconformity to the foregoing rule: *e.g.* "whoever is capable of deliberate crime is responsible; an infant is not capable of deliberate crime; therefore, an infant is not responsible:" here, the term "responsible" is affirmed universally of "those capable of deliberate crime;" it might, therefore, according to Aristotle's dictum, have been affirmed of any thing contained under that class; but in the instance before us nothing is mentioned as contained under that class, only the term infant is *excluded* from that class; and though what is affirmed of a whole class may be affirmed of any thing that *is* contained under it, there is no ground for supposing that it may be *denied* of whatever is *not* so contained; for it is evidently possible that it may be applicable to a whole class and to something else besides: to say, *e.g.* that all trees are vegetables, does not imply that *nothing else* is a vegetable. It is evident, therefore, that such an apparent argument as the above does not comply with the rule laid down, and is consequently invalid.

Again, in this instance, "food is necessary to life; corn is food; therefore corn is necessary to life:" the term "necessary to life" is affirmed of food, but *not universally;* for it is not said of *every kind of food:* the meaning of the assertion being manifestly that *some* food is necessary to life: here again therefore the rule has not been complied with, since that which is predicated, (*i.e.* affirmed or denied,) not of the *whole,* but of a *part* only of a certain class, cannot be predicated of any thing, whatever is contained under that class.

The fallacy in this last case is, what is usually described in Logical language as consisting in the "non-distribution of the middle term." In order to understand this phrase, it is necessary to observe, that a proposition being an expression in which one thing is affirmed or denied of another; *e.g.* "A is B," both that of which something is said, and that which is said of it, (*i.e.* both A and B,) are called "Terms," from their being (in their nature) the extremes or *boundaries* of the proposition; and there are, of course, two, and but two, terms in a proposition, (though it may so happen that either of them may consist either of one *word,* or of several;) and a term is said to be "distributed," when it is taken universally, so as to stand for every thing it is capable of being applied to; and consequently "undistributed," when it stands for a part only of the things signified by it; thus, "*all* food," or *every* kind of food, are expressions which imply the distribution of the term "food;" "*some* food" would imply its non-distribution: and it is also to be observed, that the term of which, in one premiss, something is affirmed or denied, and to which in the other premiss something else is referred as contained in it, is called the "middle" term in the syllogism, as standing *between* the other two, (*viz.* the two terms of the conclusion,) and being the medium of proof. Now it is plain, that if in each premiss a *part* only of this middle term is employed, *i.e.* if it be not at all distributed, no

conclusion can be drawn. Hence, if in the example formerly adduced, it had been merely stated that "*something*" (not "*whatever*," or "*every thing*") "which exhibits marks of design, is the work of an intelligent author," it would not have followed, from the world's exhibiting marks of design, that that is the work of an intelligent author.

It is to be observed, also, that the words "all," and "every," which mark the distribution of a term, and "some," which marks its non-distribution, are not always introduced: they are frequently understood, and left to be supplied by the context; *e.g.* "food is necessary:" *viz.* "*some* food;" "man is mortal;" *viz.* "*every* man." Propositions thus expressed are called by Logicians "*indefinite*," because it is left undetermined by the form of the expression whether the "subject," (the term of which something is affirmed or denied being called the "subject" of the proposition, and that which is said of it, the "predicate") be distributed or not. Nevertheless it is plain that in every proposition the subject either is, or is not, distributed, though it be not declared whether it is or not; consequently every proposition, whether expressed indefinitely or not, must be either "universal" or "particular;" those being called universal, in which the predicate is said of the whole of the subject, (or in other words, where the subject is distributed;) and those, particular, in which it is said only of a part of the subject: *e.g.* "All men are sinful," is universal; "some men are sinful," particular: and this division of propositions is in Logical language said to be according to their "*quantity*."

But the distribution or non-distribution of the *predicate* is entirely independent of the *quality* of the proposition; nor are the signs "all" and "some" ever affixed to the predicate; because its distribution depends upon, and is indicated by the "*quality*" of the proposition; *i.e.* its being affirmative or negative; it being a universal rule, that the predicate of a negative proposition is distributed, and, of an affirmative, undistributed. The reason of this may easily be understood, by considering that a term which stands for a whole class may be applied to (*i.e. affirmed* of) any thing that is comprehended under that class, though the term of which it is thus affirmed may be of much narrower extent than that other, and may, therefore, be far from coinciding with the *whole* of it: thus it may be said with truth, that "the Negroes are uncivilized," though the term uncivilized be of much wider extent than "Negroes," comprehending, besides them, Hottentots, &c.: so that it would not be allowable to assert, that "*all* who are uncivilized are Negroes;" it is evident, therefore, that it is a *part* only of the term "uncivilized" that has been affirmed of "Negroes:" and the same reasoning applies to every affirmative proposition; for though it may so happen that the subject and predicate coincide, *i.e.* are of equal extent, as, *e.g.* "all men are rational

animals," (it being equally true, that "all rational animals are men,") yet this is not *implied by the form of the expression;* since it would be no less true, that "all men are rational animals," even if there were other rational animals besides man.

It is plain, therefore, that if *any part* of the predicate is applicable to the subject, it may be affirmed, and, of course, cannot be denied of that subject; and consequently, when the predicate *is denied* of the subject, it is implied that *no part* of that predicate is applicable to that subject; *i.e.* that the *whole* of the predicate is denied of the subject: for to say, *e.g.* that "no beasts of prey ruminate," implies that beasts of prey are excluded from the *whole class* of ruminant animals, and consequently that "no ruminant animals are beasts of prey." And hence results the above mentioned rule, that the distribution of the predicate is implied in negative propositions, and its nondistribution in affirmatives.

It is to be remembered, therefore, that it is not sufficient for the middle term to *occur* in a universal proposition, since if that proposition be an affirmative, and the middle term be the *predicate* of it, it will not be distributed; *e.g.* if in the example formerly given it had been merely asserted, that "all the works of an intelligent author show marks of design," and that "the universe shows marks of design," nothing could have been proved; since, though both these propositions are universal, the middle term is made the predicate in each, and both are affirmative; and accordingly the rule of Aristotle is not here complied with, since the term, "work of an intelligent author," which is to be proved applicable to "the universe," is not affirmed of the middle term, ("what shows marks of design,") under which "universe" is contained; but the middle term on the contrary is affirmed of it.

If, however, one of the premises be negative, the middle term may then be made the predicate of it, and will thus, according to the above remark, be distributed: *e.g.* "no ruminant animals are predacious; the lion is predacious; therefore the lion is not ruminant:" this is a valid syllogism; and the middle term (predacious) is distributed by being made the predicate of a negative proposition. The form, indeed, of the syllogism, is not that prescribed by the dictum of Aristotle, but it may easily be reduced to that form, by stating the first proposition thus; no predacious animals are ruminant; which is manifestly implied (as was above remarked) in the assertion, that "no ruminant animals are predacious." The syllogism will thus appear in the form to which the dictum applies.

It is not every argument, indeed, that can be reduced to this form by so short and simple an alteration as in the case before us: a longer and more complex process will often be required; and rules will hereafter be laid down to facilitate this process in certain cases: but there is no sound argument but what *can* be reduced into this form,

without at all departing from the real meaning and drift of it: and the form will be found (though more prolix than is needed for ordinary use) the most perspicuous in which an argument can be exhibited.

All reasoning whatever, then, rests on the one simple principle laid down by Aristotle; that, "what is predicated, either affirmatively or negatively, of a term distributed, may be predicated, in like manner, (*i.e.* affirmatively or negatively,) of any thing contained under that term." So that when our object is to prove any proposition, *i.e.* to show that one term may rightly be affirmed or denied of another, the process which really takes place in our minds is, that we refer that term (of which the other is to be thus predicated,) to some class, (*i.e.* middle term,) of which that other may be affirmed, or denied, as the case may be. Whatever the subject matter of an argument may be, the Reasoning itself, considered by itself, is in every case the same process; and if the writers against Logic had kept this in mind, they would have been cautious of expressing their contempt of what they call "syllogistic Reasoning," which is in truth *all* Reasoning; and instead of ridiculing Aristotle's principle for its obviousness and simplicity, would have perceived that these are in fact its highest praise: the easiest, shortest, and most evident theory, provided it answer the purpose of explanation, being ever the best.

If we conceive an inquirer to have reached, in his investigation of the theory of Reasoning, the point to which we have now arrived, a question which would be likely next to engage his attention, is, that of predication; *i.e.* since in Reasoning we are to find a middle term, which may be predicated affirmatively of the subject in question, we are led to inquire what terms may be affirmed, and what denied, of what others.

It is evident that proper names, or any other terms, which denote each but a single individual, as "Cæsar," "the Thames," "the Conqueror of Pompey," "this river," (hence called in Logic, "singular terms,") cannot be affirmed of any thing besides themselves, and are therefore to be denied of any thing else; we may say, "this river is the Thames," or "Cæsar was the conqueror of Pompey;" but we cannot say of any thing else that is the Thames.

On the other hand, those terms which are called "common," as denoting any one individual of a whole class, as "river," "conqueror," may of course be affirmed of any, or all that belong to that class; as, "the Thames is a river;" "the Rhine and the Danube are rivers."

Common terms, therefore, are called "predicables," (*viz.* affirmatively predicable,) from their capability of being affirmed of others: a singular term, on the contrary, may be subject of a proposition, but never the predicate, unless it be of a negative proposition; (as, *e.g.* the first-born of Isaac was not Jacob;) or, unless the subject and predicate be only two expressions for the same individual object, as in some of the above instances.

The process by which the mind arrives at the notions expressed by these "common" (or in popular language, "general") terms, is properly called generalization; though it is usually (and truly) said to be the business of *abstraction;* for generalization is one of the purposes to which abstraction is applied: when we *draw off*, and *contemplate separately*, any part of an object presented to the mind, disregarding the rest of it, we are said to *abstract* that part. Thus, a person might, when a rose was before his eyes or mind, make the scent a distinct object of attention, laying aside all thought of the colour, form, &c.; and thus, though it were the only rose he had ever met with, he would be employing the faculty of abstraction; but if, in contemplating several objects, and finding that they agree in certain points, we abstract the circumstances of agreement, disregarding the differences, and give to all and each of these objects a name applicable to them in respect of this agreement, *i.e.* a common name, (as "rose,") we are then said to generalize. Abstraction, therefore, does not necessarily imply generalization, though generalization implies abstraction.

Much needless difficulty has been raised respecting the results of this process; many having contended, and perhaps more having taken for granted, that there must be some really existing *thing*, corresponding to each of these general or common terms, and of which such term is the name, standing for and representing it: *e.g.* that as there is a really existing being corresponding to the proper name Ætna, and signifying it, so the common term "mountain," must have some one really existing thing corresponding to it, and of course *distinct* from each individual mountain, (since the term is not singular, but common,) yet existing *in* each, since the term is applicable to each of them. "When many different men," it is said, "are at the same time thinking or speaking about a mountain, *i.e.* not any particular one, but a mountain generally, their minds must be all employed on *something;* which must also be *one* thing, and not several, and yet cannot be any one individual:" and hence a vast train of mystical disquisitions about ideas, &c. has arisen, which are at best nugatory, and tend to obscure our view of the process which actually takes place in the mind.

The fact is, the notion expressed by a common term is merely an inadequate (or incomplete) notion of an individual; and from the very circumstance of its inadequacy, it will apply equally well to any one of several individuals: *e.g.* if I omit the mention and the consideration of every circumstance which distinguishes Ætna from any other mountain, I then form a notion (expressed by the common term mountain) which inadequately designates Ætna, and is equally applicable to any one of several other individuals.

Generalization, it is plain, may be indefinitely extended by a further abstraction applied to common terms: *e.g.* as by abstraction

from the term Socrates, we obtain the common term philosopher; so from "philosopher," by a similar process, we arrive at the more general term "man;" from "man" to "animal," &c.

The employment of this faculty at pleasure has been regarded, and perhaps with good reason, as the characteristic distinction of the human mind from that of the brutes. We are thus enabled, not only to separate, and consider singly, one part of an object presented to the mind, but also to fix arbitrarily upon whatever part we please, according as may suit the purpose we happen to have in view: *e.g.* any individual person to whom we may direct our attention, may be considered either in a political point of view, and accordingly referred to the class of merchant, farmer, lawyer, &c. as the case may be; or physiologically, as negro, or white man; or theologically, as Pagan or Christian, Papist or Protestant; or geographically, as European, American, &c. &c. And so, in respect of any thing else that may be the subject of our Reasoning: we arbitrarily fix upon and abstract that point which is essential to the purpose in hand; so that the same object may be referred to various different classes, according to the occasion. Not, of course, that we are allowed to refer any thing to a class to which it does *not* really belong; which would be pretending to abstract from it something that was *no* part of it; but that we arbitrarily fix on *any part* of it which we choose to abstract from the rest. It is important to notice this, because men are often disposed to consider each object as really and properly belonging to some one class alone, from their having been accustomed, in the course of their own pursuits, to consider in one point of view only things which may with equal propriety be considered in other points of view also: *i.e.* referred to various classes, (or predicates.) And this is that which chiefly constitutes what is called narrowness of mind: *e.g.* a mere Botanist might be astonished at hearing such plants as clover and lucerne included, in the language of a farmer, under the term "grasses," which he has been accustomed to limit to a tribe of plants widely different in all Botanical characteristics; and the mere farmer might be no less surprised to find the troublesome "weed," (as he has been accustomed to call it,) known by the name of couch grass, and which he has been used to class with nettles and thistles, to which it has no *Botanical* affinity, ranked by the Botanist as a species of wheat, (*Triticum Repens.*) And yet neither of these classifications is in itself erroneous or irrational: though it would be absurd in a Botanical treatise to class plants according to their Agricultural use; or in an Agricultural treatise, according to the structure of their flowers.

The utility of these considerations, with a view to the present subject, will be readily estimated, by recurring to the account which has been already given of the process of Reasoning; the analysis of which shows, that it consists in referring the term we are speaking of

to some class, *viz.* a middle term ; which term again is referred to or excluded from (as the case may be) another class, *viz.* the term which we wish to affirm or deny of the subject of the conclusion. So that the quality of our Reasoning in any case must depend on our being able, correctly, clearly, and promptly, to *abstract* from the subject in question that which may furnish a middle term suitable to the occasion.

The imperfect and irregular sketch which has here been attempted, of the Logical System, may suffice (even though some parts of it should not be at once fully understood by those who are entirely strangers to the study) to point out the general drift and purpose of the Science, and to render the details of it both more interesting and more intelligible. The analytical form, which has here been adopted, is, generally speaking, the best suited for *introducing* any science in the plainest and most interesting form ; though the synthetical, which will henceforth be employed, is the most regular and the most compendious form for storing it up in the memory

CHAPTER I.

OF THE OPERATIONS OF THE MIND AND OF TERMS.

THERE are three operations of the mind which are concerned in argument: 1st. Simple Apprehension; 2d. Judgment; 3d. Discourse or Reasoning. 1st. Simple apprehension is the notion (or conception) of any object in the mind, analogous to the perception of the senses. It is either incomplex or complex: incomplex apprehension is of one object, or of several without any *relation* being perceived between them, as of "a man," "a horse," "cards:" complex is of several *with* such a relation, as of "a man on horseback," "a pack of cards."

2d. Judgment is the comparing together in the mind two of the notions, (or ideas,) whether complex or incomplex, which are the objects of apprehension, and pronouncing that they *agree* or *disagree* with each other; (or that one of them *belongs* or does not belong to the other.) Judgment therefore is either *affirmative* or *negative*.

3d. Reasoning (or discourse) is the act of proceeding from one judgment, to another *founded* upon it, (or the result of it.)

§ 2. Language affords the *signs* by which these operations of the mind are expressed and communicated. An act of *Apprehension* expressed in language, is called a *Term;* an act of *Judgment*, a *Proposition;* an act of *Reasoning*, an *Argument* or Syllogism; as *e.g.*

> "Every dispensation of Providence is beneficial;
> Afflictions are dispensations of Providence,
> Therefore they are beneficial:" is a Syllogism;

(the act of Reasoning being indicated by the word "*therefore,*") it consists of three *Propositions*, each of which has (necessarily) two *Terms*, as "beneficial," "dispensations of Providence," &c.

Language is employed for various purposes, *e.g.* the province of an historian is to *convey information;* of an orator, to *persuade*, &c. Logic is concerned with it only when employed for the purpose of *Reasoning*, (*i.e.* in order to *convince;*) and whereas, in reasoning, *Terms* are liable to be *indistinct*, (*i.e.* without any clear determinate meaning,) *Propositions*, to be *false*, and *Arguments*, *inconclusive*. Logic undertakes directly and completely to guard against *this last* defect, and incidentally and in a certain degree against the others, as far as can be done by the *proper use of language:* it is, therefore,

(when regarded as an *art*[1]) "the art of employing language properly for the purpose of Reasoning." Its importance no one can rightly estimate who has not long and attentively considered how much our thoughts are influenced by words, and how much error, perplexity, and labour, are occasioned by a faulty use of language.

A Syllogism being, as aforesaid, resolvable into three Propositions, and each Proposition containing two Terms; of these Terms, that which is spoken of, is called the *Subject;* that which is said of it, the *Predicate;* and these two together are called the *Terms,* (or extremes,) because, logically, the subject is placed *first,* and the predicate *last:* and, in the middle, the Copula, which indicates the act of Judgment, as by it, the Predicate is affirmed or denied of the Subject. It must be either IS or IS NOT; the substantive verb being the only *verb* recognised by Logic: all others are resolvable, by means of the verb, "to be," and a participle or adjective; *e.g.* "the Romans conquered:" the word "conquered" is both Copula and Predicate, being equivalent to "*were* (Cop.) *victorious*" (Pred.)[2]

§ 3. It is evident that a Term may consist either of one word or of several; and that it is not every word that is capable of being employed by itself as a Term; *e.g.* adverbs, prepositions, &c., and also nouns in any other case besides the nominative. A noun may be by itself a Term; a verb (all except the substantive verb used as the Copula,) is resolvable into the Copula and Predicate, to which it is equivalent, and indeed is often so resolved in the mere rendering out of one language into another; as "*ipse adest,*" he is present. It is to be observed, however, that under "verb," we do not include the infinitive, which is properly a noun substantive, nor the participle, which is a noun adjective. They are *verbals,* being related to their respective verbs in respect of *the things they signify;* but not *verbs,* inasmuch as they differ entirely in their *mode of signification.* It is worth observing, that an infinitive (though it often comes last in the sentence) is *never the Predicate,* except when another infinitive is the Subject. It is to be observed, also, that in English there are two infinitives, one, in "*ing,*" the same in sound and spelling as the participle present, from which, however, it should be carefully distin-

[1] It is to be observed, however, that as a *science* is conversant about *knowledge only,* an *art* is the *application* of knowledge to *practice;* hence Logic (as well as any other system of knowledge) becomes, when applied to practice, an *art;* while confined to the *theory* of Reasoning, it is strictly a *science:* and it is as such that it occupies the higher place in point of dignity, since it professes to develop some of the most interesting and curious intellectual phenomena.

[2] It is proper to observe, that the Copula, as such, has no relation to *time;* but expresses merely the agreement or disagreement of two given terms: hence, if any other *tense* of the substantive verb, besides the present, is used, it is either to be understood as the same in sense, (the difference of tense being regarded as a matter of grammatical convenience only;) or else, if the circumstance of time really do *modify the sense* of the whole proposition, so as to make the use of that tense an essential, then this circumstance is to be regarded as a part of one of the terms: "*at that time,*" or some such expression, being understood. Sometimes the substantive verb is both Copula and Predicate; *i.e.* where existence only is predicated: *e.g.* Deus *est.*

guished; *e.g.* "rising early is healthful," and "it is healthful to rise early," are equivalent.

An adjective (including participles) cannot, by itself, be made the Subject of a Proposition; but is often employed as a Predicate; as "Crassus was rich;" though some choose to consider some substantives as understood in every such case, (*e.g.* rich man) and consequently do not reckon adjectives among simple Terms; *i.e.* words which are capable, simply, of being employed as Terms. This, however, is a question of no practical consequence.

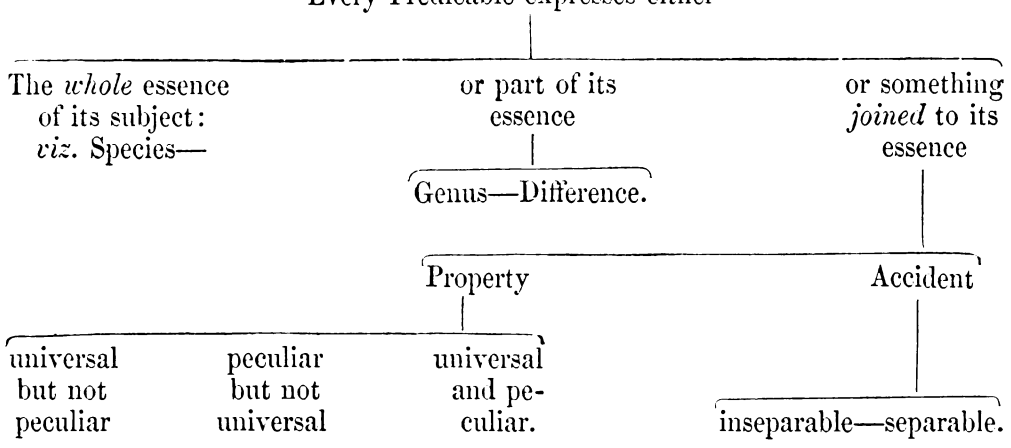
Of simple Terms, then, (which are what the first part of Logic treats of) there are many divisions;[3] of which, however, one will be sufficient for the present purpose; *viz.* into *singular* and *common;* because, though any Term whatever may be a *Subject,* none but a *common* Term can be affirmatively *predicated* of *several* others. A singular Term stands for *one individual,* as "Cæsar," "the Thames;" (these, it is plain, cannot be said [or predicated] *affirmatively,* of any thing but themselves.) A common Term stands for several individuals: *i.e.* can be *applied* to any of them, as comprehending them in its *single signification;* as "man," "river," "great." The notions expressed by these common Terms, we are enabled to form, by the faculty of *abstraction:* for by it, in contemplating any object (or objects,) we can attend exclusively to some particular circumstances belonging to it, [some certain parts of its nature as it were] and quite withhold our attention from the rest. When, therefore, we are thus contemplating several individuals which *resemble* each other in some *part* of their nature, we can (by attending to *that part alone,* and not to those points in which they differ) assign them *one common name,* which will express or stand for them merely as far as they all *agree;* and which of course will be applicable to all or any of them; (which process is called *generalization,*) and each of these names is called a *common* Term, from its belonging to them *all alike;* or a *Predicable,* because it may be predicated affirmatively of them, or of any one of them.

Generalization (as has been remarked) implies abstraction, but it is not the same thing; for there may be abstraction without generalization: when we are speaking of an individual, it is usually an abstract notion that we form; *e.g.* suppose we are speaking of the present ex-King of France; he must actually be either at Paris or elsewhere; sitting, standing, or in some other posture; and in such and such a dress, &c. Yet many of these circumstances, (which are *separable* accidents, (vide § 7.) and consequently) which are regarded as *non-essential to the individual,* are quite disregarded by us; and we *abstract*

[3] The usual divisions of words into univocal, equivocal, and analogous, and into words of the first and second intention, however, are not, strictly speaking, divisions of *words,* but divisions of the *manner of employing* them: the *same* word may be employed either univocally, equivocally, or analogously; either in the first intention or in the second.

from them what we consider as essential; thus forming an *abstract* notion of the individual. Yet there is here no generalization.

§ 4. Whatever Term can be affirmed of several things, must express either their *whole essence*, which is called the *Species;* or a *part* of their essence, (*viz.* either the material part, which is called the *Genus*, or the *formal* and *distinguishing part*, which is called *Differentia*,) or in common discourse, *characteristic*, or something *joined to the essence*, whether *necessarily*, which is called a *property*, or *contingently*, which is an *accident*.



It is evident from what has been said, that the Genus and Difference put together make up the Species: *e.g.* "rational" and "animal" constitute "man;" so that, *in reality*, the Species contains the Genus (*i.e.* implies it;) and when the Genus is called a *whole*, and is said to *contain* the Species, this is only a *metaphorical* expression, signifying that it *comprehends* the Species, in its own more *extensive* signification: *e.g.* if I predicate of Cæsar that he is an *animal*, I say the truth indeed, but not the *whole* truth; for he is *not only* an animal, but a man; so that "man" is a more *full and complete* expression than "animal;" which for the same reason is more *extensive*, as it contains, (or rather comprehends) and may be predicated of, several other Species, *i.e.* "beast," "bird," &c. In the same manner the name of a *Species* is a more *extensive*, but less *full and complete* term than that of an *individual*, (*viz.* a singular term;) since the Species may be predicated of each of these. [Note, that Genus and Species are commonly said to be *predicated in quid*, (τι) (*i.e.* to answer to the question "what?" as, "what is Cæsar?" Answer, "a man:" "what is a man?" Answer, "an animal.") Difference, in "*quale quid;*" (ποιον τι) Property and Accident in *quale* (ποιον).]

§ 5. A *Genus, which is also a Species*, is called a *subaltern* Genus or Species; as "bird," which is the Genus of "pigeon," (*i.e.* of which "pigeon" is a Species) is itself a *Species* of "animal." A Genus

which is *not* considered as a *Species* of any thing, is called *summum* (the highest) Genus; a Species which is *not* considered as a *Genus* of any thing, *i.e.* is regarded as containing under it only *individuals*, is called *infima* (the lowest) Species.

When I say of a magnet, that it is "a kind of *iron ore*," that is called its *proximum* Genus, because it is the closest (or lowest) Genus that can be predicated of it: "mineral" is its more *remote* Genus.

When I say that the *Differentia* of a magnet is its "*attracting iron*," and that its *Property* is "*polarity*," these are called respectively a specific Difference and Property; because magnet is an *infima Species*, (*i.e. only* a Species.)

When I say that the *Differentia* of iron ore is its "*containing iron*," and its Property "*being attracted by the magnet*," these are called respectively, a *generic* Difference and Property, because iron ore is a *subaltern* Species or Genus, being both the *Genus* of *magnet*, and a *Species* of *mineral*.

That is the most strictly called a Property, which belongs to the *whole* of a Species, and to that Species *alone;* as polarity to the magnet. [And such a *property*, it is often hard to distinguish from the *Differentia;* but whatever you *consider* as the most *essential to the nature* of a Species with respect to the matter you are engaged in, you must call the *Differentia;* as "rationality" to "man;" and whatever you consider as rather an *accompaniment* (or result) of that Difference, you must call the *Property;* as the "use of speech" seems to be a result of rationality.] But very many Properties which belong to the *whole* of a Species are not peculiar to it; as, "to breathe air" belongs to every *man*, but not to man alone; and it is, therefore, strictly speaking, not so much a Property of the Species "man," as of the higher, *i.e.* more comprehensive, Species, which is the Genus of that, *viz.* of "land animal." Other Properties, as some Logicians call them, are *peculiar* to a Species, but do not belong to the whole of it: *e.g.* man *alone* can be a poet, but it is not *every* man that is so. These, however, are more commonly and more properly reckoned as *Accidents*.

For that is most properly called an Accident, which may be absent or present, the essence of the Species continuing the same; as, for a man to be "*walking*," or a "*native of Paris:*" of these two examples, the former is what Logicians call a *separable* Accident, because it may be separated from the *individual:* (*e.g.* he may sit down;) the latter is an *inseparable* Accident, being not separable from the individual, (*i.e.* he who is an individual of Paris can never be otherwise;) "from the individual," I say, because *every Accident* must be separable from the *Species*, else it would be a *Property*.

Let it here be observed, that both the general name "Predicable," and each of the classes of Predicables, (*viz.* Genus, Species, &c.) are *relative; i.e.* we cannot say *what Predicable* any Term is, or whether

it is any at all, unless it be specified *of what* it is to be predicated: *e.g.* the Term "red" would be considered a *Genus*, in relation to the Terms "pink," "scarlet," &c., it might be regarded as the *Differentia*, in relation to "red rose;"—as a property of "blood;"—as an Accident of "a house," &c.

And universally, it is to be steadily kept in mind, that no "common Terms" have, as the names of individuals have, any *real thing existing in nature* corresponding to them; (τόδε τι, as Aristotle expresses it, though he has been represented as the champion of the opposite opinion: vide *Categ.* c. 3.) but is merely a name denoting a certain *inadequate notion* which our minds have formed of an individual, and which, consequently, not including any thing wherein that individual differs from certain others, is applicable equally well to all or any of them: thus "man" denotes no real thing (as the sect of the Realists maintained,) distinct from each individual, but merely, *any* man, viewed *inadequately*, *i.e.* so as to omit and abstract from all that is peculiar to each individual; by which means the Term becomes applicable alike to any one of several individuals, or (in the plural) to several together; and we arbitrarily fix on the circumstance which we thus choose to abstract and consider separately, disregarding all the rest; so that the same individual may thus be referred to any of several different Species, and the same Species to several Genera, as suits our purpose. Thus it suits the farmer's purpose to class his cattle with his ploughs, carts, and other possessions, under the name of "*stock:*" the naturalist, suitably to *his* purpose, classes them as "*quadrupeds,*" which Term would include wolves, deer, &c., which to the farmer would be a most improper classification: the commissary, again, would class them with corn, cheese, fish, &c., as "*provision.*" That which is most essential in one view, being subordinate in another.

§ 6. An *individual* is so called because it is incapable of *logical Division;* which is a metaphorical expression to signify "the distinct (*i.e.* separate) enumeration of several things signified by one common name." This operation is directly opposite to *generalization*, (which is performed by means of abstraction;) for as in that, you *lay aside* the *difference* by which several things are distinguished, so as to call them all by one *common name*, so, in division, you *add on* the differences, so as to enumerate them by their *several particular* names. Thus, "mineral" is said to be divided into "stones, metals," &c.; and metals again into "gold, iron," &c., and these are called the parts (or members) of the Division.

The rules for Division are three: 1st, each of the parts, or any of them short of *all*, must *contain less* (*i.e.* have a narrower signification) than the thing divided. 2d. All the parts together must be exactly equal to the thing divided; (therefore we must be careful to ascertain that the *summum Genus* may be predicated of *every* Term placed under it, and of nothing else.) 3d. The parts or members must be

opposed; i.e. must not be contained in one another: *e.g.* if you were to divide "book" into "poetical, historical, folio, quarto, French, Latin," &c., the members would be contained in each other; for a French book may be a quarto, and a quarto, French, &c. You must be careful, therefore, to keep in mind the *principle of Division* with which you set out: *e.g.* whether you begin dividing books according to their *matter*, their *language*, or their *size*, &c., these being also so many *cross Divisions*. And when any thing is capable (as in the above instance) of being divided in several different ways, we are not to reckon one of these as the true, or real, or right one, without specifying what the object is which we have in view: for one mode of dividing may be the most suitable for one purpose, and another, for another; as, *e.g.* one of the above modes of dividing books would be the most suitable to a bookbinder; another in a philosophical, and the other in a philological view.

It must be carefully remembered, that the word "Division," as employed in Logic, is, as has been observed already, *metaphorical;* for to divide, means originally and properly to separate the component parts of any thing, each of which is of course absolutely less than the whole: *e.g.* a tree (*i.e. any individual tree*) might be divided "physically," as it is called, into root, trunk, branches, leaves, &c. Now it cannot be said that a root or a leaf is a tree: whereas in a Logical Division each of the members is, in reality, *more* than the whole: *e.g.* if you divide tree (*i.e. the Genus, tree*) into oak, ash, elm, &c., we may say of the oak, or of any individual oak, that "it is a tree;" for by the very word "oak," we express not only the general notion of a tree, but *more, viz.* the peculiar characteristic (*i.e.* difference) of that kind of tree.

It is plain, then, that it is *logically* only, *i.e.* in our mode of speaking, that a Genus is said to contain (or rather, *comprehend*) its Species; while metaphysically, *i.e.* in our conceptions, a Species contains, *i.e. implies*, its Genus.

Care must be taken not to confound a *physical* Division with a *Logical*, against which a caution is given under R. 1.

§ 7. *Definition* is another metaphorical word, which literally signifies, "laying down a boundary;" and is used in Logic to signify an expression which explains any term, so as to *separate* it from every thing else, as a boundary separates fields. A nominal Definition (such as are those usually found in a *dictionary* of one's own language) explains only the *meaning of the term*, by giving some equivalent expression, which may happen to be better known. Thus you might define a "Term," that which forms one of the *extremes* or *boundaries* of a "Proposition;" and a "Predicable," that which may be predicated; "decalogue," ten commandments; "telescope," an instrument for viewing distant objects, &c. A real *Definition* is one which explains and unfolds the *nature of the thing;* and each of these

kinds of Definition is either *accidental* or *essential*. An *essential* Definition assigns (or lays down) the *constituent parts of the essence*, (or nature.) An *accidental* Definition (which is commonly called a *Description*) assigns the circumstances *belonging* to the essence, *viz.* Properties and Accidents, (*e.g.* causes, effects, &c.) thus, "man" may be *described* as "an animal that uses fire to dress his food," &c. [And here note, that in *describing a Species*, you cannot mention any thing which is strictly an *Accident*, because if it does not belong to the *whole* of the Species, it cannot define it: in describing an *individual*, on the contrary, you enumerate the *Accidents*, because by them it is that one individual differs from another, and in this case you add *the Species: e.g.* "Philip was a *man* of Macedon, who subdued Greece," &c. Individuals, it is evident, can be defined in this way alone.]

Lastly, the essential Definition is divided into *physical* (*i.e.* natural) and *Logical* or *Metaphysical:* the *physical* Definition lays down the *real parts of the essence* which are actually separable; the *logical*, lays down the *ideal* parts of it, which cannot be separated except in the *mind:* thus, a plant would be defined *physically*, by enumerating the leaves, stalks, roots, &c., of which it is composed: *logically*, it would be defined an organized being, destitute of sensation; the former of these expressions expressing the Genus, the latter, the Difference: for a *logical Definition* must always consist of the *Genus* and *Differentia*, which are the parts of which Logic considers every thing as consisting, and which evidently are separable in the *mind alone*. Thus "man" is defined "a rational animal," &c. So also a "Proposition" might be defined, physically, a Subject and Predicate combined by a Copula: the parts here enumerated being actually separable; but logically it would be defined "a sentence which affirms or denies;" and these two parts of the essence of a Proposition (which are the *Genus* and *Differentia* of it) can be separated in the mind only. And note, that the difference is not always *one* quality, but is frequently *compounded* of several together, no one of which would alone suffice.

Definitions are divided into nominal and real, according to the *object accomplished* by them; whether to explain, merely, the meaning of the word, or the nature of the thing: they were divided into accidental, physical, and logical, according to the *means employed* by each for accomplishing their respective objects, whether it be the enumeration of attributes, or of the physical or the metaphysical parts of the essence. These, therefore, are evidently two cross divisions. In this place we are concerned with nominal Definitions only, (except, indeed, of logical Terms,) because all that is requisite for the purposes of *Reasoning* (which is the proper province of Logic,) is, that a Term shall not be used in *different senses:* a real Definition of any thing belongs to the science or system which is employed about that thing. It is to be noted, that in Mathematics the nominal and real Defini-

tion exactly coincide; the *meaning of the word*, and the *nature of the thing*, being exactly *the same*. This holds good also with respect to logical Terms, most legal, and many ethical terms.

It is scarcely credible how much confusion has arisen from the ignorance of these distinctions which has prevailed among logical writers.

The principal rules for Definition are three; *viz.* 1st. The Definition must be *adequate; i.e.* neither too extensive nor too narrow for the thing defined: *e.g.* to define "fish," "an animal that lives in the water," would be too *extensive*, because many insects, &c., live in the water; to define it, "an animal that has an air-bladder," would be too *narrow;* because many fish are without any.

2d. The Definition must be in itself plainer than the thing defined, else it would not *explain it:* I say, "in itself," (*i.e.* generally,) because, to some particular person, the term defined may happen to be even more familiar and better understood, than the terms of the definition.

3d. It must be couched in a *convenient number* of *appropriate* words, (if such can be found suitable for the purpose:) for *figurative* words (which are opposed to appropriate) are apt to produce ambiguity or indistinctness: too great *brevity* may occasion *obscurity;* and too great *prolixity*, *confusion*.

CHAPTER II.

OF PROPOSITIONS.

§ 1. THE second part of Logic treats of the *Proposition;* which is, "*Judgment expressed in words.*"

A proposition is defined logically "*a sentence indicative,*" *i.e.* affirming or denying; (this excludes *commands* and *questions.*) "Sentence" being the *Genus*, and "indicative" the *Difference*, this definition expresses the whole essence; and it relates entirely to the *words* of a Proposition. With regard to the *matter*, its Property is to be *true* or *false*, and therefore it must not be *ambiguous*, (for that which has more than one *meaning*, is in reality *several* Propositions;) nor *imperfect*, nor *ungrammatical*, for such an expression has no meaning at all.

Since the *Substance* (*i.e. Genus*, or material part) of a Proposition is, that it is a *sentence;* and since every *sentence* (whether it be a *Proposition* or not) may be expressed either *absolutely*, (as "Cæsar deserved death;" "did Cæsar deserve death?") or under an *hypothesis* (as, "if Cæsar was a tyrant, what did he deserve?" "Was Cæsar a hero or a villain?" "If Cæsar was a tyrant, he deserved death;" "he was either a hero or a villain,") on this we found the division of Propositions according to their *substance; viz.* into *categorical* and *hypothetical.* And as Genus is said to be *predicated in quid*, (what,) it is by the members of this division that we answer the question, *what* is this Proposition? (*quæ est propositio.*) Answer, categorical or hypothetical.

Categorical Propositions are subdivided into *pure*, which asserts *simply* or *purely*, that the subject does or does not agree with the predicate, and *modal*, which expresses in what *mode* (or manner) it agrees; *e.g.* "an intemperate man will be sickly;" "Brutus killed Cæsar;" are *pure.* "An intemperate man will *probably* be sickly;" "Brutus killed Cæsar *justly;*" are *modal.* At present we speak only of *pure categorical* Propositions.

It being the *Differentia* of a *Proposition*, that it *affirms or denies*, and its *Property* to be *true or false;* and Differentia being predicated in *quale quid;* Property in *quale*, we hence form another division of Propositions, *viz.* according to their *quality*, into *affirmative*, and *negative*, (which is the *quality of the expression*, and therefore (in Logic) essential;) and into true and false, (which is the quality of the *matter*, and therefore *accidental.*) An affirmative Proposition is one whose *Copula* is affirmative, as "birds fly;" "not to advance is to go back;" a negative proposition is one whose *Copula* is negative, as "man is not perfect;" no "miser is happy."

Another division of Propositions is according to their *quantity*, (or extent;) if the Predicate is said of the *whole* of the Subject, the Proposition is *universal;* if of a *part* of it only, the Proposition is *particular*, (or partial;) *e.g.* "England is an island;" "all tyrants are miserable;" "no miser is rich;" are *universal* Propositions, and their Subjects are therefore said to be *distributed*, being understood to stand, each, for *the whole* of its significates: but, "*some* islands are fertile;" "all tyrants are not assassinated;" are *particular*, and their Subjects, consequently not *distributed*, being taken to stand for a part only of their significates.

As every Proposition must be either *affirmative* or *negative*, and must also be either *universal* or *particular*, we reckon in all, four kinds of pure categorical Propositions, (*i.e.* considered as to their quantity and quality *both;*) *viz.* universal affirmative, whose symbol (used for brevity,) is *A;* universal negative, *E;* particular affirmative, *I;* particular negative *O*.

§ 2. When the subject of a Proposition is a common Term, the *universal signs* ("all, no, every,") are used to indicate that it is distributed, (and the Proposition consequently is universal;) the *particular signs*, ("some, &c.") the contrary; should there be *no sign* at all to the common Term, the quantity of the Proposition (which is called an *indefinite* Proposition) is ascertained by the *matter; i.e.* the nature of the connection between the extremes; which is either necessary, impossible, or contingent. In necessary and in impossible matter, an indefinite is *understood as a universal: e.g.* "birds have wings;" *i.e. all:* "birds are not quadrupeds;" *i.e. none:* in contingent matter, (*i.e.* where the terms partly (*i.e.* sometimes) agree, and partly not,) an indefinite is understood as a particular; *e.g.* "food is necessary to life;" "birds sing;" *i.e. some* do; "birds are not carnivorous;" *i.e.* "*some* are not," or, "all are not."

As for *singular* Propositions, (*viz.* those whose Subject is either a *proper name*, or a common Term with a *singular* sign,) they are reckoned as universals, (see Ch. IV. § 2,) because in them we speak of the *whole* of the subject: *e.g.* when we say, "Brutus was a Roman," we mean the *whole* of Brutus: this is the general rule; but some singular Propositions may fairly be reckoned *particular; i.e.* when some qualifying word is inserted, which indicates that you are not speaking of the *whole* of the subject; *e.g.* "Cæsar was not *wholly* a tyrant;" "this man is *occasionally* intemperate;" "*non omnis moriar.*" It is evident that the *Subject* is *distributed* in every universal Proposition, and never in a *particular;* (that being the very difference between universal and particular Propositions;) but the distribution or non-distribution of the *Predicate*, depends (not on the *quantity*, but) on the *quality*, of the Proposition; for, if any *part of the Predicate* agrees with the Subject, it must be *affirmed* and not *denied* of the Subject; therefore, for an affirmative Proposition to be true, it is

sufficient that some *part of the Predicate* agree with the subject; and (for the same reason) for a negative to be true, it is necessary that the *whole* of the Predicate should *disagree* with the Subject: *e.g.* it is true that "learning is useful," though the whole of the Term "useful" does not agree with the Term "learning," (for many things are useful besides learning,) but "no vice is useful," would be false, if any part of the Term "useful" agreed with the Term "vice;" (*i.e.* if you could find any one useful thing which was a vice.) The two practical rules then to be observed respecting distribution, are,

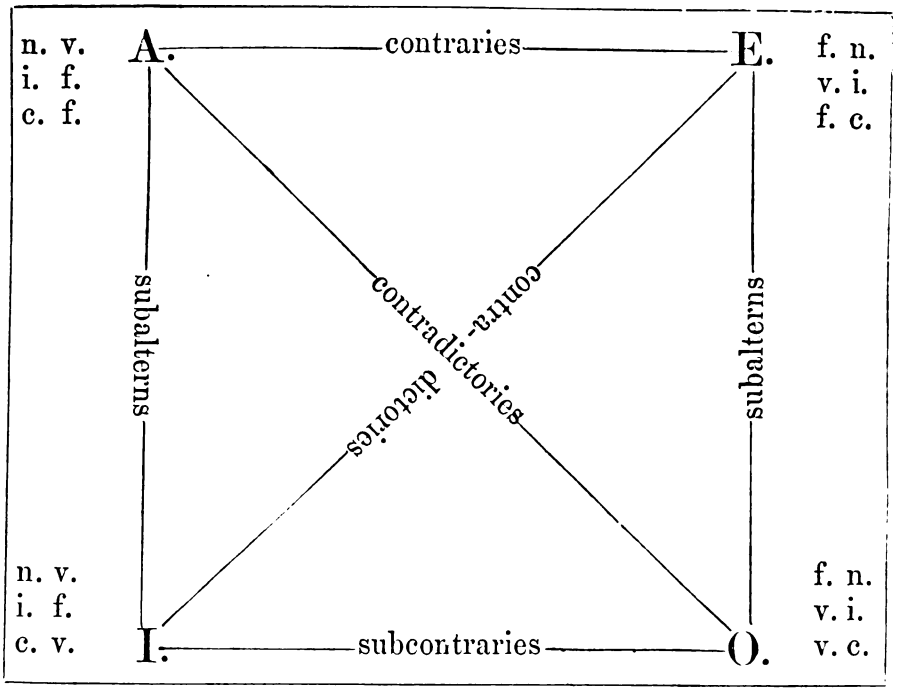
1st. All universal Propositions (and no particular) distribute the *Subject.*

2d. All *negative,* (and no affirmative) the Predicate.

It *may happen* indeed, that the whole of the Predicate in an affirmative may agree with the Subject; *e.g.* it is equally true, that "all men are rational animals;" and "all rational animals are men:" but this is merely *accidental,* and is not at all *implied* in the *form of expression,* which alone is regarded in Logic.

OF OPPOSITION.

§ 3. Two Propositions are said to be opposed to each other, when, having the same Subject and Predicate, they differ in *quantity,* or *quality,* or *both.* It is evident, that with any given Subject and Predicate, you may state four distinct Propositions, *viz.* A, E, I, and O; and any two of these are said to be *opposed;* hence there are four different kinds of opposition, *viz.* 1st. the two universals, (A and E) are called *contraries* to each other; 2d. the two particular, (I and O,) *subcontraries;* 3d. A and I, or E and O, *subalterns;* 4th. A and O, or E and I, *contradictories.* As it is evident that the truth or falsity of any Proposition (its quantity and quality being known,) must depend on the *matter* of it, we must bear in mind that, "*in necessary matter all affirmatives are true, and negatives false; in impossible matter, vice versâ; in contingent matter, all universals false, and particulars true;*" (*e.g.* "*all* islands, (or, *some* islands,) are surrounded by water," must be true, because the *matter is necessary:* to say, "*no* islands, or some —*not,* &c." would have been false; again, "*some* islands are fertile;" "*some* are not fertile," are both true, because it is contingent matter: put "*all*" or "no" instead of "*some,*" and the propositions will be false.) Hence it will be evident, that contraries will be *both false* in contingent matter, but never *both true:* subcontraries, *both true* in contingent matter, but never *both false:* contradictories, always *one true* and *the other false,* &c. with other observations, which will be immediately made on viewing the scheme; in which the four Propositions are denoted by their symbols; the different kinds of *matter,* by the initials n, i, c, and the *truth* or *falsity* of each Proposition in each matter, by the letter v. for (*verum*) true, f. for (*falsum*) false.



By a careful study of this scheme, bearing in mind, and applying the above rule concerning matter, the learner will easily elicit all the maxims relating to Opposition; as that, in the subalterns, the truth of the particular (which is called the *subalternate*) follows from the truth of the universal (*subalternans*) and the falsity of the universal from the falsity of the particular: that subalterns differ in *quantity alone;* contraries, and also subcontraries in *quality alone;* contradictories, in both: and hence, that if any Proposition is known to be true, we infer that its contradictory is false; if false, its contradictory true, &c.

OF CONVERSION.

§ 4. A Proposition is said to be *converted* when its Terms are *transposed:* when nothing more is done, this is called *simple* Conversion. No Conversion is of any use, unless it be *illative: i.e. when the truth of the converse follows from* the truth of the exposita, (or proposition given;) *e.g.*

"No virtuous man is a rebel, *therefore*
No rebel is a virtuous man."

"Some boasters are cowards, *therefore*
Some cowards are boasters."

Conversion can then only be illative when *no Term is distributed in the converse, which was not distributed in the exposita:* (for if that be done, you will employ a Term *universally* in the converse, which was only used *partially* in the exposita.) Hence, as E distributes both Terms, and I neither, these Propositions may be illatively converted in the simple manner; (vid. Rule 2.) But as A does not distribute

the Predicate, its simple Conversion would not be illative; (*e.g.* from "all birds are animals," you cannot infer that "all animals are birds,") as there would be a Term distributed in the converse, which was not before. We must therefore *limit its quantity* from universal to particular, and the Conversion will be illative: (*e.g.* "some animals are birds:") this might be fairly named Conversion by *limitation;* but is commonly called "*Conversion per accidens.*" E may thus be converted also. But in O, whether the quantity be changed or not, there will still be a Term (the Predicate of the converse) distributed, which was not before: you can therefore only convert it by changing the quality; *i.e.* considering the negative as attached to the *Predicate instead of to the Copula,* and thus regarding it as I. One of the Terms will then not be the same as before; but the Proposition will be æquipollent; (*i.e.* convey the same meaning,) *e.g.* "some members of the University are not learned:" you may consider "*not learned*" as the Predicate, instead of "*learned;*" the Proposition will then be I, and of course may be simply converted, "some who are not learned are members of the University." This may be named Conversion by negation; or as it is commonly called, by contra-position. A may also be fairly converted in this way, *e.g.*

"Every poet is a man of genius; *therefore*
He who is not a man of genius, is not a poet:"
(or, "None but a man of genius can be a poet.")

For (since it is the same thing, to *affirm* some Attribute of the Subject, or to *deny* the *absence* of that Attribute,) the original Proposition is precisely æquipollent to this,

subj. pred.
"No poet is not a man of genius;

which, being E, may of course be simply converted. Thus, in one of these three ways, every Proposition may be illatively converted: *viz.* "*E, I, simply; A, O, by negation;* A, E, limitation." Note, that as it was remarked, that in some affirmatives, the whole of the Predicate does actually agree with the Subject; so, when this is the case, A may be illatively converted, simply; but this is an accidental circumstance. In a *just definition,* this is always the case; for there the terms being *exactly equivalent,* (or, as they are called, *convertible Terms,*) it is no matter which is made the Subject, and which the Predicate, *e.g.* "a good government is that which has the happiness of the governed for its object;" if this be a *right definition,* it will follow that "a government which has the happiness of the governed for its object, is a good one." Most Propositions in Mathematics are of this description: *e.g.*

"All equilateral triangles are equiangular;" and
"All equiangular triangles are equilateral."

CHAPTER III.

OF ARGUMENTS.

§ 1. THE third operation of the mind, *viz. Reasoning* (or discourse) expressed in words, is *Argument;* and an Argument stated *at full length,* and in its *regular form* is called a *Syllogism:* the third part of Logic therefore treats of the *Syllogism.* Every Argument consists of two parts; that which *is to be proved;* and that *by means of which* it is proved: the former is called *before* it is proved the *Question; when proved,* the *Conclusion,* (or *inference;*) that which is used to prove it, if stated *last,* (as is often done in *common discourse,*) is called the *Reason,* and is introduced by "*because,*" or some other causal conjunction; (*e.g.* "Cæsar deserved death, *because* he was a tyrant, and all tyrants deserve death.") If the Conclusion be stated *last,* (which is the strict *logical form,* to which all reasoning may be reduced,) then that which is employed to prove it is called the *Premises;* and the Conclusion is then introduced by some *illative* conjunction, as "therefore:" *e.g.*

"All tyrants deserve death;
Cæsar was a tyrant;
therefore he deserved death."

Since then an Argument is an expression in which "*from something laid down and granted as true, (i.e. the Premises) something else, (i.e. the Conclusion) beyond this, must be admitted to be true, as following necessarily, (or resulting) from the other;*" and since Logic is wholly concerned in the use of language, it follows that a Syllogism (which is an Argument stated in a regular logical form,) must be "an Argument so expressed, that the conclusiveness of it is manifest from *the mere force of the expression,*" *i.e.* without considering the *meaning of the Terms: e.g.* in this syllogism, "B is A, C is B, therefore C is A:" the conclusion is inevitable, whatever Terms A, B, and C, respectively, are understood to stand for. And to this form, all legitimate Arguments may ultimately be brought.

§ 2. The rule or axiom, (commonly called "*dictum de omni et nullo,*") by which Aristotle proves the validity of this Argument is this: "*whatever is predicated of a Term distributed, whether affirmatively or negatively, may be predicated in like manner, of every thing contained under it.*" Thus, in the examples above, A is predicated of B distributed, and C is *contained under* B, (*i.e.* is its Subject;)

therefore A is predicated of C: so "all tyrants, &c." (p. 37.) This rule may be *ultimately* applied to all Arguments; (and their validity ultimately rests on their conformity thereto;) but it cannot be *directly and immediately* applied to *all*, even of pure *categorical* Syllogisms; for the sake of brevity therefore some other axioms are commonly applied in practice, to avoid the occasional tediousness of reducing all Syllogisms to that form in which Aristotle's *dictum* is applicable.

We will speak first of pure categorical Syllogisms; and the axioms or canons by which their validity is to be proved: *viz.* first, *if two Terms agree with one and the same third, they agree with each other:* second, *if one Term agrees and another disagrees with one and the same third, these two disagree with each other.* On the former of these canons rests the validity of *affirmative* conclusions; on the latter, of *negative:* for no Syllogism can be faulty which does not violate these canons; none correct which does: hence on these two canons are built the rules or cautions which are to be observed with respect to Syllogisms, for the purpose of ascertaining whether those canons have been strictly observed or not.

1st. *Every Syllogism has three, and only three Terms; viz.* the two Terms (or *extremes*, as they are commonly called) of the Conclusion, (or question;) (whereof first, the *Subject* is called the *minor Term;* second, the *Predicate*, the *major;*) and third, the *middle Term*, with which each of them is separately compared, in order to judge of their agreement or disagreement with each other. If therefore there were *two* middle terms, the *extremes*, (*or Terms of the Conclusion*) not being both compared to the *same*, could not be compared to each other.

2d. Every Syllogism has three, and only three Propositions; *viz.* first, the *major Premiss*, (in which the major Term is compared with the *middle;*) second, the *minor Premiss*, (in which the minor Term is compared with the *middle;*) and third, the Conclusion, in which the minor Term is compared with the major.

3d. Note, that if the *middle Term is ambiguous, there are in reality two middle Terms, in sense*, though but one in *sound.* An ambiguous middle Term is either an equivocal Term, used in different senses in the two Premises; (*e.g.*

"*Light* is contrary to darkness;
Feathers are *light;* therefore
Feathers are contrary to darkness.")

Or a Term *not distributed;* for as it is then used to stand for a *part* only of its signification, it may happen that one of the extremes may have been compared with *one part* of it, and the other, with another part of it; *e.g.*

"White is a colour,
Black is a colour; therefore
Black is white."—Again,

"Some animals are beasts,
Some animals are birds; therefore
Some birds are beasts."

The middle Term therefore must be distributed once, at least, in the Premises; (*i.e.* by being the subject of an universal, or Predicate of a negative, Ch. II. § 2. p. 33.) and once is sufficient; since if one extreme has been compared to a *part* of the middle Term, and another to the *whole* of it, they must have been both compared to the *same.*

4th. *No Term must be distributed in the Conclusion which was not distributed in one of the premises;* for that (it is called an *illicit* process, either of the major or the minor Term) would be to employ the *whole* of a Term in the Conclusion, when you had employed only a *part* of it in the Premiss; and thus, in reality, to introduce a fourth Term; *e.g.*

"All quadrupeds are animals,
A bird is not a quadruped; therefore
It is not an animal."—Illicit process of the major.

5th. *From negative Premises you can infer nothing.* For in them the middle is pronounced *to disagree with both extremes;* not to *agree with both;* or to agree with one, and *disagree* with the other; therefore they cannot be compared together; *e.g.*

"A fish is not a quadruped,"
"A bird is not a quadruped," proves nothing.

6th. *If one Premiss be negative, the conclusion must be negative;* for in that Premiss the middle Term is pronounced to disagree with one of the extremes, and in the other Premiss, (which of course is affirmative, by the preceding rule) to agree with the other extreme; therefore the extremes disagreeing with each other, the conclusion is negative. In the same manner it may be shown, that *to prove a negative conclusion one of the Premises must be a negative.*

By these six rules, all syllogisms are to be tried; and from them it will be evident, first, that *nothing can be proved from two particular Premises;* (for you will then have *either the middle Term undistributed,* or an *illicit process; e.g.*

"Some animals are sagacious;
Some beasts are not sagacious;
Some beasts are not animals.")

And for the same reason, secondly, that if one of the Premises be particular, the Conclusion must be particular; *e.g.* from

"All who fight bravely deserve reward;
Some soldiers fight bravely;"

you can only infer that some soldiers deserve reward.

For to infer a universal Conclusion, would be an illicit process of the minor. But from two universal Premises you cannot always infer a universal Conclusion; *e.g.*

> "All gold is precious,
> All gold is a mineral; therefore
> *Some* mineral is precious."

And even when we *can* infer a universal, we are always *at liberty* to infer a particular; since what is predicated of *all* may *of course be* predicated of some.

OF MOODS.

§ 3. When we designate the three Propositions of a Syllogism in their order, according to their respective quantity and quality, (*i.e.* their *symbols*) we are said to determine the *Mood* of the Syllogism; *e.g.* the example just above, "all gold, &c." is in the Mood A,A,I. As there are four kinds of Propositions, and three Propositions in each Syllogism, all the possible ways of combining these four, (A,E,I,O,) by threes, are sixty-four. For any one of these four may be the major Premiss; each of these four majors may have four different minors, and of these sixteen pairs of Premises, each may have four different Conclusions. $4 \times 4 (= 16) \times 4 = 64$. This is a mere arithmetical calculation of the moods, without any regard to the Logical rules: for many of these Moods are inadmissible in practice, from violating some of those rules; *e.g.* the Mood E,E,E, must be rejected, as having *negative Premises;* I, O, O, for *particular Premises;* and many others for the same faults. By examination then of all, it will be found that of the sixty-four, there remain but twelve Moods, which can be used in a legitimate Syllogism, *viz.* A, A, A, A, A, I, A, E, E, A, E, O, A, I, I, A, O, O, E, A, E, E, A, O, E, I, O, I, A, I, I, E, O, O, A, O.

OF FIGURE.

§ 4. The Figure of a Syllogism consists in the situation of the middle Term with respect to the extremes of the conclusion, (*i.e. the major and minor term.*) When the middle Term is made the *subject of the major Premiss, and the Predicate of the minor*, that is called the first Figure; (which is far the most natural and clear of all, as to this alone, Aristotle's dictum may be *at once* applied.) In the second Figure the middle Term is the predicate of *both* Premises: in the third, *the Subject* of both: in the fourth, the Predicate of the major Premiss, and the Subject of the minor. (This is the most awkward and unnatural of all, being the very reverse of the first.) Note, that the *proper order* is to place the major Premiss *first*, and the minor *second;* but this does not *constitute* the major and minor Premises; for that Premiss (wherever placed) is the major which *contains the*

major Term, and the minor, the minor, (vid. R. 2. p. 38.) Each of the allowable Moods mentioned above, will not be allowable in every Figure; since it may violate some of the foregoing rules, in one Figure, though not in another: *e.g.* I, A, I, is an allowable Mood in the third Figure; but in the first, it would have an *undistributed middle*. So A, E, E, would in the first figure have an *illicit process of the major*, but is allowable in the second; and A, A, A, which in the first Figure is allowable, would in the third have an *illicit process of the minor:* all which may be ascertained by trying the different Moods in each Figure, as per scheme.

Let A represent the major Term, C the minor, B the middle.

1st Fig.	2d Fig.	3d Fig.	4th Fig.
B, A,	A, B,	B, A,	A, B,
C, B,	C, B,	B, C,	B, C,
C, A,	C, A,	C, A,	C, A.

The Terms alone being here stated, the *quantity and quality* of each Proposition (and consequently the Mood of the whole Syllogism) is left to be filled up: (*i.e.* between B, and A, I may place either a negative or affirmative Copula; and I may prefix either a *universal* or *particular* sign to B.) By applying the Moods then to each Figure, it will be found that each Figure will admit six Moods only, as not violating the rules against *undistributed middle*, and against *illicit process:* and of the Moods so admitted, several (though valid) are *useless*, as having a particular Conclusion, when a *universal might have* been drawn; *e.g.* A, A, I, in the first Figure,

> "All human creatures are entitled to liberty;
> All slaves are human creatures; therefore
> *Some* slaves are entitled to liberty."

Of the twenty-four Moods then (six in each Figure) five are for this reason neglected: for the remaining nineteen, Logicians have devised names to distinguish both the Mood itself, and the figure in which it is found; since when one Mood (*i.e. one in itself*, without regard to Figure) occurs in two different Figures, (as E, A, E, in the first and second) the mere letters denoting the Mood would not inform us concerning the Figure. In these names then, the *three vowels* denote the Propositions of which the Syllogism is composed; the consonants (besides their other uses, of which hereafter) serve to keep in mind the Figure of the Syllogism.

Fig. 1. bArbArA, cElArEnt, dArII, fErIOque prioris.
Fig. 2. cEsArE, cAmEstrEs, fEstInO, bArOkO, secundæ.
Fig. 3. { tertia, dArAptI, dIsAmIs, dAtIsI, fElAptOn, bOkArdO, fErIsO, habet: quarta insuper addit.
Fig. 4. brAmAntIp, cAmEnEs, dImArIs, fElApO, frEsIsOn.

By a careful study of these mnemonic lines (which must be committed to memory) you will perceive that A can only be proved in the first Figure, in which also every other proposition may be proved; that the second proves only *negatives;* the third only *particulars*, &c.; with many other such observations, which will readily be made, (on trial of several Syllogisms, in different Moods) and the reasons for which will be found in the foregoing rules. *E.G.* To show why the second Figure has only negative Conclusions, we have only to consider, that in it the middle Term being the *Predicate in both Premises*, would not be *distributed* unless one Premiss were *negative;* (vid. R. 2. p. 28.) therefore the conclusion must be negative also, by R. 6. p. 39. One Mood in each Figure may suffice in this place by way of example; first, *Barbara, viz.* (bAr.)

Every B is A; (bA) every C is B; therefore (rA) every C is A, *e.g.* let the major Term (which is represented by A) be "one who possesses all virtue;" the minor term (C) "every man who possesses one virtue;" and the middle term (B) "every one who possesses prudence;" and you will have the celebrated argument of Aristotle, *Eth.* sixth book, to prove that the virtues are inseparable; *viz.*

"He who possesses prudence, possesses all virtue;
He who possesses one virtue, must possess prudence; therefore
He who possesses one, possesses all."

Second, *Camestres*, (cAm) every A is B; (Es) no C is B; (trEs) no C is A. Let the major term (A) be "true philosophers," the minor (C) "the Epicureans;" the middle (B) "reckoning virtue a good in itself;" and this will be part of the reasoning of Cicero, *Off.* book first and third, against the Epicureans. Third, *Darapti, viz.* (dA) every B is A; (rAp) every B is C; therefore (tI,) some C is A: *e.g.*

"Prudence has for its object the benefit of individuals;
But prudence is a virtue; therefore
Some virtue has for its object the benefit of the individual,"

is part of Adam Smith's reasoning, (*Moral Sentiments,*) against Hutcheson and others, who placed all virtue in benevolence. Fourth, *Camenes, viz.* (cAm) every A is B; (En,) no B is C; therefore (Es,) no C is A: *e.g.*

"Whatever is expedient, is conformable to nature;
Whatever is conformable to nature, is not hurtful to society; therefore
What is hurtful to society is never expedient,"

is part of Cicero's argument in *Off.* third book: but it is an inverted and clumsy way of stating what would much more naturally fall into the first Figure; for if you examine the propositions of a Syllogism in the fourth Figure, *beginning* at the *Conclusion*, you will see that as the major Term is predicated of the minor, so is the minor of the

middle, and that again of the major: so that the major appears to be merely *predicated of itself*. Hence the five Moods in this Figure are seldom or never used; some one of the fourteen (*Moods with names*) in the first three Figures, being the forms into which all Arguments may most readily be thrown; but of these, the four in the first Figure are the clearest and most natural; as to them, Aristotle's dictum will *immediately* apply. And as it is on this dictum that all Reasoning *ultimately* depends, so all Arguments may be somehow or other brought into some one of these four Moods; and a Syllogism is, in that case, said to be *reduced: (i.e. to the first Figure.)* These four are called the *perfect* Moods, and all the rest, *imperfect.*

OSTENSIVE REDUCTION.

§ 5. In reducing a Syllogism, we are not of course allowed to introduce any new Term or Proposition, having nothing granted but the truth of the Premises; but these Premises are allowed to be *illatively converted*, (because the truth of any Proposition *implies* that of its illative converse) *or transposed:* by taking advantage of this liberty, where there is need, we deduce in Figure one, from the Premises originally given, either the *very same Conclusion* as the original one, or another from which the *original Conclusion* follows, by illative Conversion; *e.g. Darapti.*

> "All wits are dreaded;
> All wits are admired;
> Some who are admired are dreaded."

Into *Darii*, by converting by limitation (*per accidens*) the minor Premiss.

> "All wits are dreaded;
> Some who are admired are wits; therefore
> Some who are admired are dreaded."

Camestres.

> "All true philosophers account virtue a good in itself;
> The advocates of pleasure do not account, &c.
> Therefore they are not true philosophers."

Reduced to *Celarent*, by simply converting the minor, and then transposing the Premises.

> "Those who account virtue a good in itself, are not advocates of pleasure;
> All true philosophers account virtue, &c.; therefore
> No true philosophers are advocates of pleasure."

This Conclusion may be *illatively converted* into the original one.

Baroko, e.g.

"Every true patriot is a friend to religion;
Some great statesmen are not friends to religion;
Some great statesmen are not true patriots."

To *Ferio*, by converting the major *by negation* (contraposition) vide Ch. II. § 4.

"He who is not a friend to religion, is not a true patriot;
Some great statesmen, &c.,"

and the rest of the Syllogism remains the same; only that the minor Premiss must be considered as affirmative, because you take "not a friend to religion" as the middle Term. In the same manner *Bokardo* to *Darii; e.g.*

"Some slaves are not discontented;
All slaves are wronged; therefore
Some who are wronged are not discontented."

Convert the major by negation, (contraposition) and then transpose them; the Conclusion will be the *converse by negation of the original one*, which therefore may be inferred from it; *e.g.*

"All slaves are wronged;
Some who are not discontented are slaves;
Some who are not discontented are wronged."

In these ways (which are called *Ostensive Reduction*, because you prove in the first Figure, either the *very same* conclusion as before, or one *which implies it*) all the imperfect Moods may be reduced to the four perfect ones. But there is also another way, called *reductio ad impossibile*,

§ 6. By which we prove (in the first Figure) not directly that the original Conclusion is *true*, but that it *cannot be false; i.e.* that an absurdity would follow from the supposition of its being false, *e.g.*

"All true patriots are friends to religion;
Some great statesmen are not friends to religion;
Some great statesmen are not true patriots."

If this conclusion be not true, its contradictory must be true; *viz.*

"All great statesmen are true patriots."

Let this then be assumed, in the place of the minor Premiss of the original Syllogism, and a false Conclusion will be proved; *e.g.* bAr.

"All true patriots are friends to religion;
bA, All great statesmen are true patriots;
rA, *All great statesmen are friends to religion:*"

for as this Conclusion is the contradictory of the original minor Premiss, it must be false, since the premises are always supposed to be granted; therefore one of the *Premises* (by which it has been correctly proved) must be false also; but the major Premiss (being one of those originally granted) is *true;* therefore the *falsity must be in the minor Premiss;* which is the *contradictory* of the original Conclusion; therefore the original Conclusion must be true. This is the *indirect* mode of Reasoning.

§ 7. This kind of Reduction is seldom employed but for *Baroko* and *Bokardo*, which are thus reduced by those who confine themselves to *simple* Conversion, and Conversion by limitation, (*per accidens;*) and they framed the names of their Moods with a view to point out the manner in which each is to be reduced; *viz.* B, C, D, F, which are the initial letters of all the Moods, indicate to which Mood of the first Figure, (*Barbara, Celarent, Darii,* and *Ferio,*) each of the others is to be reduced: *m,* indicates that the Premises are to be *transposed; s,* and *p,* that the Proposition denoted by the vowel immediately preceding, is to be *converted; s,* simply, *p, per accidens,* (by limitation:) thus, in *Camestres,* (see example, p. 42,) the *C,* indicates that it must be reduced to *Celarent;* the two *ss,* that the minor Premiss and Conclusion must be *converted simply;* the *m,* that the Premises must be *transposed. K,* (which indicates the reduction *ad impossibile*) is a sign that the Proposition denoted by the vowel immediately before it, must be left out, and the contradictory of the Conclusion substituted; *viz.* for the *minor* Premiss in *Baroko,* and the *major* in *Bokardo.* But it has been already shown, that the Conversion by contraposition, (by negation,) will enable us to reduce these two Moods, *ostensively.*

CHAPTER IV.

OF MODAL SYLLOGISMS, AND OF ALL ARGUMENTS BESIDES REGULAR AND PURE CATEGORICAL SYLLOGISMS.

Of Modals.

§ 1. Hitherto we have treated of *pure* categorical Propositions, and the Syllogisms composed of such: a *Modal* Proposition may be stated as a *pure* one, by *attaching the Mode to one of the Terms;* and the Proposition will in all respects fall under the foregoing rules; *e.g.* "John killed Thomas *wilfully and maliciously;*" here the mode is to be regarded as part of the Predicate. "It is *probable* that all knowledge is useful;" "probably useful" is here the Predicate; but when the Mode is only used to express the necessary, contingent, or impossible connection of the Terms, it may as well be attached to the *Subject: e.g.* "man is *necessarily* mortal;" is the same as, "*all* men are mortal:" and "this man is *occasionally* intemperate," has the force of a *particular:* (vide Part II. § 2. p. 33.) It is thus that two singular Propositions may be contradictories; *e.g.* "this man is *never* intemperate," will be the *contradictory* of the foregoing. Indeed every sign (of universality or particularity) may be considered as a *Mode.* Since, however, in all Modal Propositions, you assert that the dictum (*i.e.* the *assertion itself*) and the *mode,* agree together, or disagree, so, in some cases, this may be the most convenient Way of stating a Modal, purely: *e.g.* "It (subj. cop.) *is* (pred.) *impossible* (subject.) that all men should be virtuous." (subject.) Such is a proposition of St. Paul's:—"This (subject. cop.) is a faithful saying, &c. (pred.) that Jesus Christ came into the world to save sinners." (subject.) In these cases, one of your *Terms* (the Subject) is itself *an entire Proposition.* Thus much for Modal Propositions.

Of Hypotheticals.

§ 2. A hypothetical Proposition is defined to be, *two or more categoricals united by a Copula,* (or conjunction;) and the different kinds

of hypothetical Propositions are named from their respective conjunctions; *viz.* conditional, disjunctive, causal, &c.

When a hypothetical Conclusion is inferred from a hypothetical Premiss, so that the force of the Reasoning does not turn on the hypothesis, then the hypothesis (as in Modals) must be considered *as part of one of the Terms;* so that the *Reasoning* will be, in effect, categorical: *e.g.*

"Every conqueror (predicate.) is either a hero or a villain:
Cæsar was a conqueror; therefore
He was (predicate.) either *a hero or a villain.*"

"Whatever comes from God is entitled to reverence;
If the Scriptures are not wholly false, (subject.) they must come from God;
If they are not wholly false, they are entitled to reverence."

But when the *Reasoning* itself *rests* on the hypothesis, (in which way a categorical Conclusion may be drawn from a hypothetical Premiss,) this is what is called a *hypothetical Syllogism;* and rules have been devised for ascertaining the validity of such Arguments, at once, without bringing them into the categorical form. (And note, that in these Syllogisms the *hypothetical Premiss* is called the *major*, and the *categorical one*, the *minor*.) They are of two kinds, *conditional* and *disjunctive.*

OF CONDITIONALS.

§ 3. A *Conditional* Proposition has in it an *illative force; i.e.* it contains two, and only two categorical Propositions, whereof one *results* from the other, (or, follows from it,) *e.g.*

"If (antecedent.) the Scriptures are not wholly false,
they are entitled to respect." (consequent.)

That from which the other results, is called the *antecedent; that which results from it*, the *consequent*, (*consequens;*) and the *connection* between the two, (expressed by the word "if") the *consequence*, (*consequentia.*) The natural order is, that the antecedent should come *before* the consequent; but this is frequently reversed: *e.g.* "the husbandman is well off if he knows his own advantages;" Virg. *Geor.* And note, that the truth or falsity of a conditional Proposition depends entirely on the *consequence: e.g.* "if Logic is useless, *it* deserves to be neglected;" here both antecedent and consequent are *false:* yet the

whole proposition is *true; i.e.* it is true that the consequent *follows* from the antecedent. "If Cromwell was an Englishman, he was an usurper," is just the reverse case: for though it is true that "Cromwell was an Englishman," and also that "he was an usurper," yet it is not true that the latter of these Propositions *depends on* the former; the whole Proposition, therefore, is false, though both antecedent and consequent are true. A Conditional Proposition, in short, may be considered as an assertion of the *validity* of a certain Argument; since to assert that an Argument is *valid*, is to assert that the Conclusion necessarily results from the Premises, whether those Premises be *true* or not. The meaning, then, of a Conditional Proposition is this; that, *the antecedent being granted, the consequent* is granted: which may be considered in two points of view: first, if the antecedent *be* true, the consequent *must* be true; hence the first rule; *the antecedent being granted, the consequent may be inferred:* secondly, if the antecedent *were* true, the consequent *would* be true; hence the second rule; *the consequent being denied, the antecedent may be denied;* for the antecedent must in that case be false; since if it were true, the consequent (which is granted to be false) would be true also: *e.g.* "if this man has a fever, he is sick;" here, if you *grant the antecedent*, the first rule applies, and you infer the truth of the consequent; "he has a fever, therefore he is sick:" if A is B, C is D; but A is B, therefore C is D, (and this is called a *constructive* Conditional Syllogism;) but if you *deny the consequent* (*i.e.* grant its *contradictory*,) the second rule applies, and you infer the *contradictory of the antecedent:* "he is not sick, therefore he has not a fever:" this is the *destructive* Conditional Syllogism: if A is B, C is D; C is not D, therefore A is not B. Again, "if the crops are not bad, corn must be cheap:" for a major; then, "but the crops are not bad, therefore corn must be cheap," is constructive. "Corn is not cheap, therefore the crops are bad," is destructive. "If every increase of population is desirable, some misery is desirable; but no misery is desirable, therefore, some increase of population is not desirable," is destructive. But if you *affirm* the *consequent*, or *deny* the *antecedent*, you can infer nothing; for the same consequent may *follow from other* antecedents: *e.g.* in the example above, a man may be sick *from other* disorders besides a fever; therefore it does not follow from his being sick, that he has a fever; nor (for the same reason) from his *not* having a fever, that he is *not* sick. There are, therefore, two, and only two kinds of Conditional Syllogisms; the *constructive*, founded on the first rule, and answering to *direct* Reasoning; and the *destructive*, on the second, answering to *indirect*. And note, that a conditional Proposition may (like the categorical A,) be *converted by negation; i.e.* you may take the *contradictory of the consequent*, as an *antecedent*, and the *contradictory of the antecedent*, as a *consequent: e.g.* "if this man is not sick, he has not a fever." By this conversion of the major Premiss,

a constructive Syllogism may be reduced to a destructive, and *vice versâ*. (See § 6. Ch. IV. p. 51.)

OF DISJUNCTIVES.

§ 4. A disjunctive Proposition may consist of any number of categoricals; and, of these, *some one*, at least, must be *true*, or the whole Proposition will be false: if, therefore, one or more of these categoricals be denied, (*i.e.* granted to be false,) you may infer that the remaining one, or (if several) *some one* of the remaining ones is true: *e.g.* "either the earth is eternal, or the work of chance, or the work of an intelligent being; it is not eternal, nor the work of chance; therefore it is the work of an intelligent being." "It is either spring, summer, autumn, or winter; but it is neither spring nor summer, therefore it is either autumn or winter." Either A is B, or C is D; but A is not B, therefore C is D. Note, that in these two examples (as well as very many others,) it is implied not only that *one* of the members (the categorical Propositions) must be *true*, but that *only one* can be true; so that, in such *cases*, if one or more members be *affirmed*, the rest may be *denied;* [the members may then be called *exclusive:*] *e.g.* "it is summer, therefore it is neither spring, autumn, nor winter;" "either A is B, or C is D; but A is B, therefore C is not D." But this is by no means universally the case; *e.g.* "virtue tends to procure us either the esteem of mankind or the favour of God:" here both members are true, and consequently from one being affirmed, we are not authorized to deny the other. It is evident that a disjunctive Syllogism may easily be reduced to a *conditional: e.g.* if it is not spring or summer, it is either autumn or winter, &c.

THE DILEMMA,

§ 5. Is a complex kind of Conditional Syllogism.

1st. If you have in the *major* Premiss *several antecedents* all with the *same consequent*, then these antecedents, being (in the *minor*) *disjunctively granted*, (*i.e.* it being granted that *some one* of them is true,) the one *common consequent* may be inferred, (as in the case of a simple constructive syllogism:) *e.g.* if A is B, C is D; and if X is Y, C is D; but either A is B, or X is Y; therefore C is D. "If the blest in heaven have no desires, they will be perfectly content; so they will, if their desires are fully gratified; but either they will have no desires, or have them fully gratified; therefore they will be perfectly content." Note, in this case, the two conditionals which make up the major Premiss may be united in one Proposition by means of the word "*whether:*" *e.g.* "whether the blest, &c. have no desires, or have their desires gratified, they will be content."

2d. But if the *several antecedents* have each a *different consequent*, then the antecedents, being as before, disjunctively granted, you can

only *disjunctively* infer the consequents: *e.g.* if A is B, C is D; and if X is Y, E is F: but either A is B, or X is Y; therefore either C is D, or E is F. "If Æschines joined in the public rejoicings, he is inconsistent; if he did not, he is unpatriotic; but he either joined, or not, therefore he is either inconsistent or unpatriotic." (Demost. *For the Crown.*) This case, as well as the foregoing, is evidently *constructive.* In the destructive form, whether you have one antecedent with several consequents, or several antecedents, either with one, or with several consequents; in all these cases, if you deny the *whole* of the consequent or consequents, you may in the conclusion, deny the *whole* of the antecedent or antecedents: *e.g.* "if this fact be true, it must be recorded either in Herodotus, Thucydides, or Xenophon: it is not recorded in any of the three, therefore it is not true." "If the world existed from eternity, there would be records prior to the Mosaic; and if it were produced by chance, it would not bear marks of design: there are no records prior to the Mosaic; and the world does bear marks of design; therefore it neither existed from eternity, nor is the work of chance." These are commonly called Dilemmas, but hardly differ from *simple* conditional Syllogisms. Nor is the case different if you have *one* antecedent with several consequents, which consequents you *disjunctively* deny; for that comes to the same thing as *wholly* denying them; since if they be not *all* true, the *one antecedent* must equally fall to the ground; and the Syllogism will be equally simple: *e.g.* "if we are at peace with France by virtue of the treaty of Paris, we must acknowledge the sovereignty of Buonaparte; and also we must acknowledge that of Louis: but we cannot do both of these; therefore we are not at peace," &c.; which is evidently a plain destructive. The true dilemma is, "*a conditional Syllogism with several antecedents in the major, and a disjunctive minor;*" hence,

3d. That is most properly called a *destructive Dilemma*, which has (like the constructive ones) a *disjunctive minor Premiss: i.e.* when you have several antecedents with each a different consequent; which consequents, (instead of wholly denying them, as in the last case,) you *disjunctively* deny; and thence, in the Conclusion, deny disjunctively the antecedents: *e.g.* if A is B, C is D; and if X is Y, E is F: but either C is not D, or E is not F: therefore, either A is not B, or X is not Y. "If this man were wise, he would not speak irreverently of Scripture in jest; and if he were good he would not do so in earnest; but he does it, either in jest or in earnest; therefore he is either not wise or not good." Every Dilemma may be reduced into two or more simple Conditional Syllogisms: *e.g.* "if Æschines joined, &c. he is inconsistent; he *did* join, &c. therefore he is inconsistent: and again, if Æschines did not join, &c. he is unpatriotic; he *did not*, &c. therefore he is unpatriotic." Now an opponent might deny *either* of the minor Premises in the above Syllogisms, but he could not deny *both;* and therefore he must admit one or the other of the Conclusions:

for, when a Dilemma is employed, it is supposed that *some one* of the antecedents must be true, (or, in the destructive kind, *some one* of the consequents false,) but that we cannot tell *which* of them is so; and this is the reason why the argument is stated in the form of a Dilemma. From what has been said, it may easily be seen that all Dilemmas are in fact *conditional syllogisms;* and that disjunctive Syllogisms may also be reduced to the same form: but as it has been remarked, that all Reasoning whatever may *ultimately* be brought to the one test of Aristotle's "dictum," it remains to show how a Conditional Syllogism may be thrown into such a form that that test will at once apply to it; and this is called the

REDUCTION OF HYPOTHETICALS.

§ 6. For this purpose we must consider every Conditional Proposition as a universal affirmative categorical Proposition, of which the Terms are entire Propositions, *viz.* the antecedent answering to the *Subject*, and the consequent to the *Predicate; e.g.* to say, "if Louis is a good king, France is likely to prosper;" is equivalent to saying, "the case of Louis being a good king, is a case of France being likely to prosper:" and if it be granted, as a minor Premiss to the Conditional Syllogism, that "Louis is a good king;" that is equivalent to saying, "the present case is the case of Louis being a good king:" from which you will draw a conclusion in *Barbara*, (*viz.* "the present case is a case of France being likely to prosper,") exactly equivalent to the original Conclusion of the Conditional Syllogism; *viz.* "France is likely to prosper." As the constructive condition may thus be reduced to *Barbara*, so may the destructive in like manner, to *Celarent*, *e.g.* "if the Stoics are right, pain is no evil: but pain is an evil; therefore the Stoics are not right;" is equivalent to, "the case of the Stoics being right, is the case of pain being no evil; the present case is not the case of pain being no evil; therefore the present case is not the case of the Stoics being right." This is *Camestres*, which of course is easily reduced to *Celarent*. Or, if you will, all Conditional Syllogisms may be reduced to *Barbara*, by considering them all as constructive; which may be done, as mentioned above, by converting by negation the major Premiss. (See p. 47, § 3. Ch. IV.) The reduction of Hypotheticals may always be effected in the manner above stated; but as it produces a circuitous awkwardness of expression, a more convenient form may in some cases be substituted: *e.g.* in the example above, it may be convenient to take, "*true*," for one of the Terms: "that pain is no evil is not true; that pain is no evil is asserted by the Stoics; therefore something asserted by the Stoics is not true." Sometimes again it may be better to unfold the argument into two Syllogisms: *e.g.* in a former example; first, "Louis is a good king; the governor of France is Louis; therefore the governor of France is a good king." And then, second, "every country

governed by a good king is likely to prosper," &c. [A Dilemma is generally to be reduced into two or more categorical Syllogisms.] And when the antecedent and consequent have each the *same* Subject, you may sometimes reduce the Conditional by merely substituting a categorical major Premiss for the conditional one: *e.g.* instead of "if Cæsar was a tyrant, he deserved death; he was a tyrant, therefore he deserved death;" you may put for a major, "all tyrants deserve death," &c. But it is of no great consequence, whether Hypotheticals are reduced in the most *neat and concise* manner or not; since it is not intended that they should be reduced to categorical, in *ordinary practice*, as the *readiest way* of trying their validity, (their own rules being quite sufficient for that purpose;) but only *that we should be able*, if required, to subject any argument whatever to the test of Aristotle's dictum, in order to show that all Reasoning turns upon one simple principle.

OF ENTHYMEME, SORITES, &C.

§ 7. There are various abridged forms of Argument which may be easily expanded into regular Syllogisms: such as, first, the Enthymeme, which is a Syllogism with one Premiss suppressed. As all the Terms will be found in the remaining Premiss and Conclusion, it will be easy to fill up the Syllogism by supplying the Premiss that is wanting, whether major or minor: *e.g.* "Cæsar was a tyrant; therefore he deserved death." "A free nation must be happy; therefore the English are happy."

This is the ordinary form of speaking and writing. It is evident that Enthymemes may be filled up hypothetically.

2d. When you have a string of Syllogisms, in which the Conclusion of each is made the Premiss of the next, till you arrive at the main and ultimate Conclusion of all, you may sometimes state these briefly, in a form called *Sorites;* in which the Predicate of the first proposition is made the Subject of the next; and so on, to any length, till finally the Predicate of the last of the Premises is predicated (in the Conclusion) of the Subject of the first: *e.g.* A is B, B is C, C is D, D is E; therefore A is E. "The English are a brave people; a brave people are free; a free people are happy; therefore the English are happy." A Sorites then has as many middle Terms as there are intermediate Propositions between the first and the last; and consequently it may be drawn out into as many separate Syllogisms; of which the first will have, for its *major Premiss*, the second; and for its *minor*, the *first* of the Propositions of the Sorites; as may be seen by the example. It is also evident, that in a Sorites you cannot have more than *one* negative Proposition, and one particular; for else, one of the Syllogisms would have its Premises both negative or both particular, (vid. p. 39.) A string of Conditional Syllogisms may in like manner be abridged into a Sorites; *e.g.* if A is B, C is D; if

C is D, E is F; if E is F, G is H; but A is B, therefore G is H. "If the Scriptures are the word of God, it is important that they should be well explained; if it is important, &c. they deserve to be diligently studied; if they deserve, &c. an order of men should be set aside for that purpose: but the Scriptures are the word, &c.; therefore an order of men should be set aside for the purpose, &c." Hence, it is evident, how injudicious an arrangement has been adopted by former writers on Logic, who have treated of the Sorites and Enthymeme before they entered on the subject of Hypotheticals.

Those who have spoken of induction or of example, as a distinct kind of Argument in a Logical point of view, have fallen into the common error of confounding *Logical* with *Rhetorical* distinctions, and have wandered from their subject as much as a writer on the orders of Architecture would do, who should introduce the distinction between buildings of stone and of marble. Logic takes no cognizance of induction, for instance, or of *a priori* reasoning, &c. as distinct *Forms* of argument; for when thrown into the syllogistic form, and when letters of the alphabet are substituted for the Terms (and it is thus that Argument is properly to be brought under the cognizance of Logic,) there is no distinction between them; *e.g.* a Property which belongs to the ox, sheep, deer, goat, and antelope, belongs to all horned animals; rumination belongs to these; therefore, to all. This, which is an inductive argument, is evidently a Syllogism in *Barbara*. The essence of an inductive argument (and so of the other kinds which are distinguished for it,) consists, not in the *form of the Argument*, but in the relation which the *Subject matter* of the Premises bears to that of the Conclusion.

3d. There are various other abbreviations commonly used, which are so obvious as hardly to call for explanation: as, where one of the Premises of a Syllogism is itself the Conclusion of an Enthymeme which is expressed at the same time: *e.g.* "all useful studies deserve encouragement; Logic is such, (*since it helps us to reason accurately,*) therefore it deserves encouragement;" here, the minor Premiss is what is called an *Enthymematic sentence*. The *antecedent* in that minor Premiss, (*i.e.* that which *makes* it Enthymematic,) is called by Aristotle the *Prosyllogism*.

It is evident that you may for brevity substitute for any term an *equivalent;* as in the last example, "*it*" for "Logic;" "*such*" for "a useful study," &c.

4th. And many Syllogisms, which at first appear faulty, will often be found, on examination, to contain correct reasoning, and, consequently, to be reducible to a regular form; *e.g.* when you have, *apparently*, *negative Premises*, it may happen, that by considering one of them as *affirmative*, (see Ch. II. § 4. p. 35,) the Syllogism will be regular: *e.g.* "no man is happy who is not secure; no tyrant is

secure; therefore no tyrant is happy," is a Syllogism in *Celarent.*[4] Sometimes there will appear to be too many terms; and yet there will be no fault in the Reasoning, only an irregularity in the expression: *e.g.* "no irrational agent could produce a work which manifests design; the universe is a work which manifests design; therefore no irrational agent could have produced the universe." Strictly speaking, this Syllogism has five Terms; but if you look to the meaning, you will see, that in the first Premiss (considering it *as a part of this Argument,*) it is not, properly, "an irrational agent" that you are speaking of, and of which you predicate that it could not produce a work manifesting design; but rather it is this "work," &c. of which you are speaking, and of which it is predicated that it could not be produced by an irrational agent; if then you state the Propositions in that form, the Syllogism will be perfectly regular.

Thus, such a Syllogism as this, "every true patriot is disinterested; few men are disinterested; therefore few men are true patriots;" might appear at first sight to be in the second Figure, and faulty; whereas it is *Barbara*, with the *Premises transposed;* for you do not really predicate of "few men," that they are "disinterested," but of "*disinterested persons,*" that they are "few." Again, "none but candid men are good reasoners; few infidels are candid; few infidels are good reasoners." In this it will be most convenient to consider the major Premiss as being "all good reasoners are candid," (which of course is precisely æquipollent to its illative converse by negation;) and the minor Premiss and Conclusion may in like manner be fairly expressed thus—"most infidels are not candid; therefore most infidels are not good reasoners:" which is a regular Syllogism in *Camestres.* Or, if you would state it in the first Figure, thus—those who are not candid (or uncandid) are not good reasoners; most infidels are not candid; most infidels are not good reasoners.

§ 8. The foregoing rules enable us to develop the principles on which all Reasoning is conducted, whatever be the Subject matter of it, and to ascertain the validity or fallaciousness of any apparent argument, as far as the *form of expression* is concerned; that being alone the proper province of Logic.

But it is evident that we may nevertheless remain liable to be deceived or perplexed in Argument by the assumption of false or doubtful Premises, or by the employment of indistinct or ambiguous terms; and, accordingly, many Logical writers, wishing to make their systems appear as perfect as possible, have undertaken to give

[4] If this experiment be tried on a Syllogism which has *really* negative Premises, the only effect will be to change that fault into another: *viz.* an excess of Terms, or, (which is substantially the same) an undistributed middle; *e.g.* "an enslaved people is not happy; the English are not enslaved; therefore they are happy:" if "enslaved" be regarded as one of the Terms, and "not enslaved" as another, there will manifestly be four. Hence you may see how very little difference there is in reality between the different faults which are enumerated.

rules "for attaining clear ideas," and for "guiding the judgment;" and fancying or professing themselves successful in this, have consistently enough denominated Logic, the "Art of using the Reason;" which in truth it would be, and would supersede all other studies, if it could alone ascertain the meaning of every Term, and the truth or falsity of every proposition, in the same manner as it actually can the validity of every Argument. And they have been led into this, partly by the consideration that Logic is concerned about the three operations of the mind—simple Apprehension, Judgment, and Reasoning; not observing that it is not equally concerned about all; the last operation being alone its appropriate province; and the rest being treated of only in reference to that.

The contempt justly due to such pretensions has most unjustly fallen on the Science itself, much in the same manner as Chemistry was brought into disrepute among the unthinking by the extravagant pretensions of the Alchemists. And those Logical writers have been censured, not (as they should have been) for *making* such professions, but for *not fulfilling* them. It has been objected, especially, that the rules of Logic leave us still at a loss as to the most important and difficult point in Reasoning; *viz.* the ascertaining the sense of the terms employed, and removing their ambiguity. A complaint resembling that made (according to a story told by Warburton in his *Div. Leg.*) by a man who found fault with all the reading-glasses presented to him by the shopkeeper; the fact being that he had never *learned to read.* In the present case, the complaint is the more unreasonable, inasmuch as there neither is, nor ever *can possibly be*, any such system devised as will effect the proposed object of clearing up the ambiguity of Terms. It is, however, no small advantage, that the rules of Logic, though they cannot alone, ascertain and clear up ambiguity in any term, point out in *which* Term of an Argument it is to be sought for, directing our attention to the middle Term, as the one on the ambiguity of which a fallacy is likely to be built.

It will be useful, however, to class and describe the different kinds of ambiguity which are to be met with; and also the various ways in which the insertion of false, or, at least, unduly assumed Premises, is most likely to elude observation. And though the remarks which will be offered on these points may not be considered as strictly forming a *part* of Logic, they cannot be thought out of place, when it is considered how essentially they are connected with the application of it.

CHAPTER V.

OF FALLACIES.

INTRODUCTION.

By a Fallacy is commonly understood, "any unsound mode of arguing, which appears to demand our conviction, and to be decisive of the question in hand, when in fairness it is not so." As we consider the ready detection and clear exposure of Fallacies to be both more extensively important, and also more difficult than many are aware of, we propose to take a Logical view of the subject; referring the different Fallacies to the most convenient heads, and giving a scientific analysis of the procedure which takes place in each.

After all, indeed, in the practical detection of each individual Fallacy, much must depend on natural and acquired acuteness; nor can any rules be given, the mere learning of which will enable us to apply them with mechanical certainty and readiness: but still we shall find that to take correct general views of the subject, and to be familiarized with scientific discussions of it, will tend, above all things, to *engender such a habit of mind* as will best fit us for practice.

Indeed the case is the same with respect to Logic in general; scarce any one would in ordinary practice, state to himself either his own or another's reasoning in Syllogisms in *Barbara* at full length; yet a familiarity with Logical principles, tends very much, (as all feel, who are really well acquainted with them,) to beget a habit of clear and sound Reasoning. The truth is, that in this, as in many other things, there are processes going on in the mind (when we are practising any thing quite familiar to us) with such rapidity as to leave no trace in the memory; and we often apply principles which did not, as far as we are conscious, even occur to us at the time.

It would be foreign, however, to the present purpose, to investigate fully the manner in which certain studies operate in remotely producing certain effects on the mind: it is sufficient to establish the *fact*, that habits of scientific analysis (besides the intrinsic beauty and dignity of such studies) lead to practical advantage. It is on Logical principles therefore that we propose to discuss the subject of Fallacies: and it might, indeed, seem to be unnecessary to make any apology for so doing, after what has been formerly said, generally, in defence of Logic, if the majority of Logical writers had not usually followed a very opposite plan. Whenever they have to treat of any thing that is beyond the mere elements of Logic, they totally lay aside all

reference to the principles which they have been occupied in establishing and explaining, and have recourse to a loose, vague, and popular kind of language; such as would be the best suited indeed to an exoterical discourse, but seems strangely incongruous in a professed Logical treatise. What should we think of a Geometrical writer, who, after having gone through the Elements with strict definitions and demonstrations, should, on proceeding to Mechanics, totally lay aside all reference to scientific principles,—all use of technical terms,—and treat of the subject in undefined terms, and with probable and popular arguments? It would be thought strange, if even a Botanist, when addressing those whom he had been instructing in the principles and the terms of his system, should totally lay these aside when he came to describe plants, and should adopt the language of the vulgar. Surely it affords but too much plausibility to the cavils of those who scoff at Logic altogether, that the very writers who profess to teach it, should never themselves make any application of, or reference to its principles, on those very occasions, when, and *when only*, such application and reference are to be expected. If the principles of any system are well laid down,—if its technical language is well framed,—then, surely those principles and that language will afford, (for those who have once thoroughly learned them,) the best, the most clear, simple, and concise method of treating any subject connected with that system. Yet even the accurate Aldrich, in treating of the Dilemma and of the Fallacies, has very much forgotten the Logician, and assumed a loose and rhetorical style of writing, without making any application of the principles he had formerly laid down, but on the contrary, sometimes departing widely from them.

The most experienced teachers, when addressing those who are familiar with the elementary principles of Logic, think it requisite, not indeed to lead them, on each occasion, *through the whole detail* of those principles, when the process is quite obvious, but always to *put them on the road*, as it were, to those principles, that they may plainly see their own way to the end, and take a scientific view of the subject: in the same manner as Mathematical writers, avoid indeed the occasional tediousness of going all through a very simple demonstration which the learner, if he will, may easily supply; but yet always speak in strict Mathematical language, and with reference to Mathematical principles, though they do not always state them at full length. We would not profess, therefore, any more than they do, to write (on subjects connected with the science,) in a language intelligible to those who are ignorant of its first rudiments; to do so, indeed, would imply that we were not taking a scientific view of the subject, nor availing ourselves of the principles which had been established, and the accurate and concise technical language which had been framed.

§ 1. The division of Fallacies into those in the words, IN DICTIONE, and those in the matter EXTRA DICTIONEM, has not

been, by any writers hitherto, grounded on any distinct principle; at least, not on any that they have themselves adhered to. The confounding together, however, of these two classes is highly detrimental to all clear notions concerning Logic; being obviously allied to the prevailing erroneous views which make Logic the *art of employing the intellectual faculties in general*, having the *discovery of truth* for its object, and all kinds of knowledge for its proper subject matter; with all that train of vague and groundless speculations which have led to such interminable confusion and mistakes, and afforded a pretext for such clamorous censures.

It is important, therefore, that rules should be given for a division of Fallacies into Logical, and Non-logical, on such a principle as shall keep clear of all this indistinctness and perplexity.

If any one should object that the division we adopt is in some degree arbitrary, placing under the one head Fallacies, which many might be disposed to place under the other, let him consider not only the indistinctness of all former divisions, but the utter impossibility of framing *any* that shall be completely secure from the objection urged, in a case where men have formed such various and vague notions, from the very want of some clear principle of division. Nay, from the elliptical form in which all Reasoning is usually expressed, and the peculiarly involved and oblique form in which Fallacy is for the most part conveyed, it must of course be often a matter of doubt, or rather, of arbitrary *choice*, not only to which genus each *kind* of Fallacy should be referred, but even to which kind to refer any *one individual* Fallacy: for since in any course of argument, one Premiss is usually suppressed, it frequently happens, in the case of a Fallacy, that the hearers are left to the alternative of supplying *either* a Premiss which is *not true*, or *else*, one which *does not prove* the conclusion; *e.g.* if a man expatiates on the distress of the country, and thence argues that the government is tyrannical, we must suppose him to assume *either* that "every distressed country is under a tyranny," which is a manifest falsehood, *or*, merely that "every country under a tyranny is distressed," which, however true, proves nothing, the middle term being undistributed. Now, in the former case, the Fallacy would be referred to the head of "*extra dictionem;*" in the latter, to that of "*in dictione:*" which are we to suppose the speaker meant us to understand? surely just whichever each of his hearers might happen to prefer: some might assent to the false Premiss; others, allow the unsound Syllogism: to the Sophist himself it is indifferent, as long as they can but be brought to admit the conclusion.

Without pretending then to conform to every one's mode of speaking on the subject, or to lay down rules which shall be, in themselves, (without any call for labour or skill in the person who employs them,) readily applicable to, and decisive on each individual case; we propose

a division which is at least perfectly clear in its main principle, and coincides, perhaps, as nearly as possible with the established notions of Logicians on the subject.

§ 2. In every Fallacy, the conclusion either *does*, or *does not follow from the Premises:* where the conclusion does not follow from the Premises, it is manifest that the fault is in the *Reasoning*, and in that alone; these, therefore, we call Logical Fallacies,[5] as being properly violations of those rules of Reasoning which it is the province of Logic to lay down. Of these, however, one kind are more *purely Logical*, as exhibiting their fallaciousness by the bare *form* of the expression, without any regard to the meaning of the terms: to which class belong: 1st. undistributed middle; 2d. illicit process; 3d. negative Premises, or affirmative conclusion from a negative Premiss, and *vice versâ:* to which may be added, 4th. those which have palpably (*i.e. expressed*) more than three terms. The other kind may be most properly called semi-logical; *viz.* all the cases of ambiguous middle term except its non-distribution: for though in such cases the Conclusion does not follow, and though the rules of Logic show that it does not, *as soon as the ambiguity of the middle term is ascertained*, yet the discovery and ascertainment of this ambiguity requires attention to the *sense of the term*, and knowledge of the subject matter; so that here, Logic "teaches us not *how to find* the Fallacy, but only *where to search* for it," and on what principles to condemn it. Accordingly it has been made a subject of bitter complaint against Logic, that it presupposes the most difficult point to be already accomplished, *viz.* the sense of the terms to be ascertained. A similar objection might be urged against every other art in existence; *e.g.* against Agriculture, that all the precepts for the cultivation of land presuppose the possession of a farm; or against Perspective, that its rules are useless to a blind man. The objection is indeed peculiarly absurd when urged against Logic, because the object which it is blamed for not accomplishing, *cannot possibly* be within the province of *any one* art whatever. Is it indeed possible or conceivable that there should be any method, science, or system, that should enable one to know the full and exact meaning of every term in existence? The utmost that can be done is to give some general rules that may assist us in this work; which is done in the two first parts of Logic.

The very author of the objection says, "this (the comprehension of the meaning of general terms) is a study which every individual must carry on for himself; and of which no rules of Logic (how useful soever they may be in directing our labours) can supersede the necessity." D. Stewart, *Phil.* Vol. II. Ch. II. S. 2.

Nothing perhaps tends more to conceal from men their imperfect

[5] Just as we call that a *criminal* Court in which crimes are judged

conception of the meaning of a term, than the circumstance of their being able fully to comprehend a *process of Reasoning* in which it is involved, without attaching any distinct meaning, or perhaps any meaning at all to that term; as is evident when A B C, are used to stand for terms, in a regular Syllogism: thus a man may be *familiarized* with a term, and never find himself *at a loss* from not comprehending it; from which he will be very likely to infer that he *does* comprehend it, when perhaps he does not, but employs it vaguely and incorrectly, which leads to fallacious reasoning and confusion. It must be owned, however, that many Logical writers have, in great measure, brought on themselves the reproach in question, by calling Logic "the right use of Reason," laying down "rules for gaining clear ideas," and such-like ἀλαζονεία, as Aristotle calls it. *Rhet.* Book I. Ch. II.

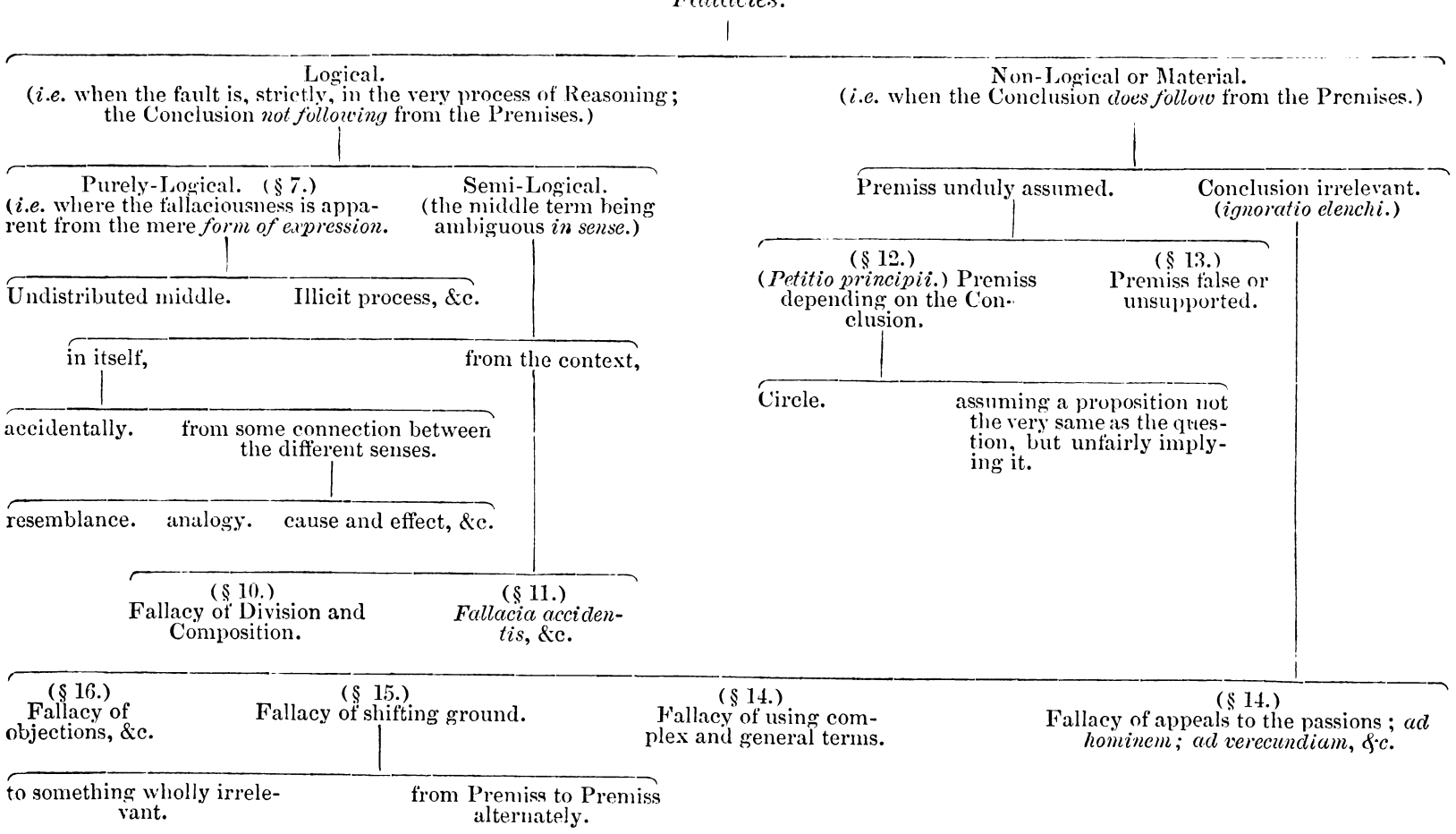
§ 3. The remaining class (*viz.* where the Conclusion does follow from the Premises) may be called the Material, or Non-logical Fallacies: of these there are two kinds; 1st. when the Premises are such as ought not to have been assumed; 2d. when the Conclusion is not the one required, but irrelevant; which Fallacy is called "*ignoratio elenchi*," because your argument is not the *elenchus*, (*i.e.* proof of the *contradictory*) of your opponent's assertion, which it should be; but proves, instead of that, some other proposition resembling it. Hence, since Logic defines what Contradiction is, some may choose rather to range this with the *Logical* Fallacies, as it seems, so far, to come under the jurisdiction of that art: nevertheless, it is perhaps better to adhere to the original division, both on account of its clearness, and also because few would be inclined to apply to the Fallacy in question the accusation of being *inconclusive*, and consequently illogical reasoning: besides which, it seems an artificial and circuitous way of speaking, to suppose in all cases an *opponent* and a *contradiction;* the simple statement of the matter being this,—I am required, by the circumstances of the case, (no matter why) to prove a certain Conclusion; I prove, not that, but one which is likely to be mistaken for it;—in this lies the Fallacy.

It might be desirable, therefore, to lay aside the name of "*ignoratio elenchi*," but that is so generally adopted as absolutely to require some mention to be made of it. The other kind of Fallacies in the matter will comprehend, (as far as the vague and obscure language of Logical writers will allow us to conjecture,) the Fallacy of "*non causa pro causâ*," and that of "*petitio principii:*" of these, the former is by them distinguished into "*a non verâ pro verâ*," and "*a non tali pro tali;*" this last would appear to be arguing from a case *not parallel* as if it *were* so; which, in Logical language, is, having the *suppressed* Premiss false; (for it is in *that* the *parallelism* is affirmed) and the "*a non verâ pro verâ*" will in like manner signify the *expressed* Premiss being false; so that this Fallacy will turn out to be,

in plain terms, neither more nor less than falsity, (or unfair assumption) of a Premiss.

The remaining kind, "*petitio principii,*" (begging the question,) takes place when a Premiss, whether true or false, is either plainly equivalent to the Conclusion, or depends on it for its own reception. It is to be observed, however, that in all correct Reasoning the Premises must, virtually, imply the conclusion; so that it is not possible to mark precisely the distinction between the Fallacy in question and fair argument; since that may be correct and fair Reasoning to one person, which would be, to another, begging the question, since to one the Conclusion might be more evident than the Premiss, and to the other, the reverse. The most plausible form of this Fallacy is arguing in a circle; and the greater the circle, the harder to detect.

§ 4. There is no Fallacy that may not properly be included under some of the foregoing heads; those which in the Logical Treatises are separately enumerated, and contradistinguished from these, being in reality instances of them, and therefore more properly enumerated in the subdivision thereof; as in the scheme annexed.


Fallacies.
Logical.
(i.e. when the fault is, strictly, in the very process of Reasoning; the Conclusion not following from the Premises.)
Non-Logical or Material.
(i.e. when the Conclusion does follow from the Premises.)
Purely-Logical. (§ 7.)
(i.e. where the fallaciousness is apparent from the mere form of expression.
Semi-Logical.
(the middle term being ambiguous in sense.)
Undistributed middle.
Illicit process, &c.
in itself,
from the context,
accidentally.
from some connection between the different senses.
resemblance.
analogy.
cause and effect, &c.
(§ 10.)
Fallacy of Division and Composition.
(§ 11.)
Fallacia accidentis, &c.
Premiss unduly assumed.
Conclusion irrelevant.
(ignoratio elenchi.)
(§ 12.)
(Petitio principii.) Premiss depending on the Conclusion.
(§ 13.)
Premiss false or unsupported.
Circle.
assuming a proposition not the very same as the question, but unfairly implying it.
(§ 16.)
Fallacy of objections, &c.
(§ 15.)
Fallacy of shifting ground.
(§ 14.)
Fallacy of using complex and general terms.
(§ 14.)
Fallacy of appeals to the passions; ad hominem; ad verecundiam, &c.
to something wholly irrelevant.
from Premiss to Premiss alternately.

§ 5. On each of the Fallacies which have been thus enumerated and distinguished, we propose to offer some more particular remarks: but before we proceed to this, it will be proper to premise two general observations, 1st. on the *importance*, and 2d. the *difficulty*, of detecting and describing Fallacies; both have been already slightly alluded to, but it is requisite that they should here be somewhat more fully and distinctly set forth.

1st. It seems by most persons to be taken for granted that a Fallacy is to be dreaded merely as a weapon fashioned and wielded by a skilful Sophist: or if they allow that a man may with honest intentions slide into one, unconsciously, in the heat of *argument*, still they seem to suppose that where there is no *dispute*, there is no cause to dread Fallacy; whereas there is much danger, even in what may be called *solitary Reasoning*, of sliding unawares into some Fallacy, by which one may be so far deceived as even to *act upon* the Conclusion thus obtained. By solitary Reasoning is meant the case in which we are not seeking for *arguments* to prove a *given question*, but labouring to elicit from our previous stock of knowledge *some useful inference*. To select one from innumerable examples which might be cited, and of which some more will occur in the subsequent part of this Essay; it is not improbable that many indifferent sermons have been produced by the ambiguity of the word "*plain:*" a young divine perceives the truth of the maxim, that "for the lower orders one's language cannot be too *plain;*" (*i.e. clear* and *perspicuous*, so as to require no learning nor ingenuity to understand it,) and when he proceeds to practice, the word "*plain*" indistinctly flits before him, as it were, and often checks him in the use of *ornaments* of style, such as metaphor, epithet, antithesis, &c. which are opposed to "plainness" in a totally different sense of the word, being by no means necessarily adverse to *perspicuity*, but rather, in many cases, conducive to it; as may be seen in several of the clearest of our Lord's discourses, which are of all others the most richly adorned with figurative language. So far, indeed, is an ornamented style from being unfit for the vulgar, that they are pleased with it even in excess. Yet the desire to be "plain," combined with that dim and confused notion which the ambiguity of the word produces in such as do not separate in their minds, and set distinctly before themselves, the two meanings, often causes them to write in a dry and bald style, which has no advantage in point of perspicuity, and is least of all suited to the taste of the vulgar. The above instance is not drawn from mere conjecture, but from actual experience of the fact.

Another instance of the strong influence of words on our ideas may be adduced from a widely different subject: most persons feel a certain degree of *surprise* on first hearing of the result of some late experiments of the agricultural Chemists, by which they have ascertained that universally what are called *heavy* soils are specifically the

lightest; and *vice versâ*. Whence this *surprise?* for no one ever *distinctly believed* the established names to be used in the literal and *primary* sense, in consequence of the respective soils having been *weighed* together; indeed it is obvious on a moment's reflection, that *tenacious clay* soils (as well as muddy roads) are *figuratively* called heavy from the difficulty of ploughing or passing over them, which produces an *effect like* that of bearing or dragging a heavy weight; yet still the terms, "light" and "heavy," though used figuratively, have most undoubtedly introduced into men's minds something of the ideas expressed by them in their primitive sense. So true is the ingenious observation of Hobbes, that "words are the counters of wise men, and the money of fools."

More especially deserving of attention is the influence of analogical terms in leading men into erroneous notions in Theology; where the most important terms are analogical; and yet, they are continually employed in Reasoning without due attention (oftener through want of caution than by unfair design) to their analogical nature; and most of the errors into which Theologians have fallen may be traced, in part, to this cause.

Thus much, as to the extensive practical influence of Fallacies, and the consequent high importance of detecting and exposing them.

§ 6. 2dly. The second remark is, that while sound Reasoning is ever the more readily admitted, the more clearly it is perceived to be such, Fallacy, on the contrary, being rejected as soon as perceived, will, of course, be the more likely to obtain reception, the more it is obscured and disguised by obliquity and complexity of expression: it is thus that it is the most likely either to slip accidentally from the careless reasoner, or to be brought forward deliberately by the Sophist. Not that he ever wishes that obscurity and complexity to be perceived; on the contrary it is for his purpose that the expression should *appear* as clear and simple as possible, while in reality it is the most tangled net he can contrive. Thus, whereas it is usual to express our Reasoning elliptically, so that a Premiss, (or even two or three entire steps in a course of argument) which may be readily supplied, as being perfectly obvious, shall be left to be understood, the Sophist in like manner suppresses what is *not* obvious, but is in reality the weakest part of the argument; and uses every other contrivance to withdraw our attention (his art closely resembling the juggler's) from the quarter where the Fallacy lies. Hence the uncertainty before mentioned, to which class any individual Fallacy is to be referred: and hence it is that the *difficulty* of detecting and exposing Fallacy, is so much greater than that of comprehending and developing a process of sound argument. It is like the detection and apprehension of a criminal in spite of all his arts of concealment and disguise; when this *is accomplished*, and he is *brought to trial* with all the evidence of his guilt produced, his conviction and punishment are easy; and this

is precisely the case with those Fallacies which are given as examples in Logical Treatises; they are in fact already detected, by being stated in a plain and regular form, and are, as it were, only brought up to *receive sentence.* Or again, fallacious Reasoning may be compared to a perplexed and entangled mass of *accounts*, which it requires much sagacity and close attention to clear up, and display in a regular and intelligible form; though *when this is once accomplished*, the whole appears so perfectly *simple*, that the unthinking are apt to undervalue the skill and pains which have been employed upon it.

Moreover, it should be remembered that a very *long* discussion is one of the most effectual veils of Fallacy. Sophistry, like poison, is at once detected, and nauseated when presented to us in a concentrated form; but a Fallacy which when stated barely, in a few sentences, would not deceive a child, may deceive half the world if *diluted* in a quarto volume. To speak, therefore, of all the Fallacies that have ever been enumerated as too glaring and obvious to need even being mentioned, because the simple instances given in books, and there stated in the plainest and consequently most easily detected form, are such as would (in that form) deceive no one; this, surely, shows either extreme weakness, or else unfairness. It may readily be allowed, indeed, that to detect *individual* Fallacies, and *bring them under* the general rules, is a harder task than to *lay down* those general rules; but this does not prove that the latter office is trifling or useless, or that it does not essentially conduce to the performance of the other: there may be more ingenuity shown in detecting and arresting a malefactor, and convicting him of the fact, than in laying down a law for the trial and punishment of such a person; but the latter office, *i.e.* that of a legislator, is surely neither unnecessary nor trifling.

It should be added, that a close observation and Logical analysis of fallacious arguments, as it tends (according to what has been already said) to form a habit of mind well suited for the practical detection of Fallacies; so, for that very reason, it will make us the more careful in making *allowance* for them; *i.e.* bearing in mind how much men in general are liable to be influenced by them: *e.g.* a *refuted argument ought* to *go for nothing;* but in *fact* it will generally prove *detrimental* to the cause, from the Fallacy which will be presently explained. No one is more likely to be practically aware of this, and to take precautions accordingly, than he who is most versed in the whole theory of Fallacies; for the best Logician is the least likely to calculate *on men in general being such.*

OF FALLACIES IN FORM,

§ 7. Enough has already been said in the preceding compendium; and it has been remarked above, that it is often left to our *choice* to refer an individual Fallacy to this head or to another.

To the present class we may the most conveniently refer those Fallacies, so common in practice, of supposing the Conclusion false, because the Premiss is false, or because the argument is unsound; and inferring the truth of the Premiss from that of the Conclusion; *e.g.* if any one argues for the existence of a God, from its being universally believed, a man might perhaps be able to refute the argument by producing an instance of some nation destitute of such belief; the argument *ought* then (as has been observed above) to *go for nothing:* but many would go further, and think that this refutation had *disproved* the existence of a God; in which they would be guilty of an *illicit process* of the major term; *viz.* "whatever is universally believed must be true; the existence of a God is not universally believed; therefore it is not true." Others again from being convinced of the truth of the Conclusion would infer that of the Premises; which would amount to the Fallacy of *undistributed middle: viz.* "what is universally believed, is true; the existence of a God is true; therefore it is universally believed." Or, these Fallacies might be stated in the hypothetical form; since the one evidently proceeds from the denial of the antecedent to the denial of the consequent; and the other from the establishing of the consequent to the inferring of the antecedent; which two Fallacies correspond respectively with those of *illicit process* of the major, and *undistributed middle.*

Fallacies of this class are very much kept out of sight, being seldom perceived even by those who employ them; but of their practical importance there can be no doubt, since it is notorious that a weak argument is always, in practice, *detrimental;* and that there is no absurdity so gross which men will not readily admit, if it appears to lead to a Conclusion of what they are already convinced. Even a candid and sensible writer is not unlikely to be, by this means, misled, when he is seeking for arguments to support a Conclusion which he has long been fully convinced of himself; *i.e.* he will often use such arguments as would never have *convinced* himself, and are not likely to convince others, but rather (by the operation of the converse Fallacy) to *confirm* in their dissent those who before disagreed with him.

It is best therefore to endeavour to put yourself in the place of an *opponent* to your own arguments, and consider whether you could not find some objection to them. The applause of *one's own party* is a very unsafe ground for judging of the real force of an argumentative work, and consequently of its real utility. To satisfy those who were doubting, and to convince those who were opposed, is the only sure test; but *these* are seldom very loud in their applause, or very forward in bearing their testimony.

OF AMBIGUOUS MIDDLE.

§ 8. That case in which the middle is undistributed, belongs of course to the preceding head, the fault being perfectly manifest from

the mere form of the expression: in that case the extremes are compared with *two parts of the same* term; but in the Fallacy which has been called semi-logical, (which we are now to speak of) the extremes are compared with *two different* terms, the middle being used in two different senses in the two Premises.

And here it may be remarked, that when the argument is brought into the form of a *regular Syllogism*, the contrast between these two senses will usually appear very striking, from the two Premises being *placed together;* and hence the scorn with which many have treated the very mention of the Fallacy of equivocation, deriving their only notion of it from the *exposure* of it in Logical Treatises; whereas, in practice it is common for the two Premises to be placed very far apart, and discussed in different parts of the discourse; by which means the inattentive hearer overlooks any ambiguity that may exist in the middle term. Hence the advantage of Logical habits, to fix our attention strongly and steadily on the *important* terms of an argument.

One case which may be regarded as coming under the head of Ambiguous middle, is, what is called "*Fallacia Figuræ Dictionis*," the Fallacy built on the grammatical structure of language, from men's usually taking for granted that *paronymous* words, (*i.e.* those belonging to each other, as the substantive, adjective, verb, &c. of the same root) have a precisely correspondent meaning: which is by no means universally the case. Such a Fallacy could not indeed be even exhibited in strict Logical form, which would preclude even the attempt at it, since it has two middle terms in sound as well as sense; but nothing is more common in practice than to vary continually the terms employed, with a view to grammatical convenience; nor is there any thing unfair in such a practice, as long as the *meaning* is preserved unaltered: *e.g.* "murder should be punished with death; this man is a murderer; therefore he deserves to die;" &c. &c. Here we proceed on the assumption (in this case just) that to commit murder and to be a murderer,—to deserve death and to be one who ought to die, are, respectively, equivalent expressions; and it would frequently prove a heavy inconvenience to be debarred this kind of liberty; but the abuse of it gives rise to the Fallacy in question: *e.g. projectors* are unfit to be trusted; this man has formed a *project*, therefore he is unfit to be trusted:[6] here the Sophist proceeds on the hypothesis that he who forms a *project* must be a *projector;* whereas the bad sense that commonly attaches to the latter word, is not at all implied in the former.

This Fallacy may often be considered as lying not in the middle, but in one of the terms of the Conclusion; so that the Conclusion drawn shall not be, in reality, at all warranted by the Premises,

[6] *Wealth of Nations*, A. Smith: Usury.

though it will appear to be so, by means of the grammatical affinity of the words: *e.g.* "to be acquainted with the guilty is a *presumption* of guilt; this man is so acquainted; therefore we may *presume* that he is guilty:" this argument proceeds on the supposition of an exact correspondence between "*presume*" and "*presumption*," which however does not really exist; for "presumption" is commonly used to express a kind of *slight suspicion;* whereas "to presume" amounts to *absolute belief.*

The above remark will apply to some other cases of ambiguity of term; *viz.* the Conclusion will often contain a term, which (though not as here, different *in expression* from the corresponding one in the Premiss, yet) is *liable* to be understood in a sense different from that which it bears to the Premiss; though of course such a Fallacy is less common, because less likely to deceive, in *those* cases, than in *this;* where the term used in the Conclusion, though professing to correspond with one in the Premiss, is not the very *same in expression*, and therefore is more *certain* to convey a different sense; which is what the Sophist wishes.

There are innummerable instances of a non-correspondence in paronymous words, similar to that above instanced; as between *art* and *artful*, *design* and *designing*, *faith* and *faithful*, &c.; and the more slight the variation of meaning, the more likely is the Fallacy to be successful; for when the words have become so widely removed in sense as "pity" and "pitiful," every one would perceive such a Fallacy, nor could it be employed but in jest.

This Fallacy cannot in practice be refuted, by stating merely the impossibility of reducing such an argument to the strict Logical form; (unless indeed you are addressing regular Logicians,) you must find some way of pointing out the non-correspondence of the terms in question; *e.g.* with respect to the example above, it may be remarked, that we speak of *strong* or *faint* "presumption," but yet we use no such expression in conjunction with the verb "presume," because the word itself *implies strength.*

No Fallacy is more common in controversy than the present, since in this way the Sophist will often be able to misinterpret the propositions which his opponent admits or maintains, and so employ them against him: thus in the examples just given, it is natural to conceive one of the Sophist's Premises to have been borrowed from his opponent.

Perhaps a dictionary of such paronymous words as do not regularly correspond in meaning, would be nearly as useful as one of synonymes; *i.e.* properly speaking, of *pseudo-synonymes.* [The present Fallacy is nearly allied to, or rather perhaps may be regarded as a branch of that founded on *Etymology; viz.* when a term is used, at one time, in its customary, and at another, in its Etymological sense. Perhaps no example of this can be found that is more extensively and mischievously employed than in the case of the word *representative:*

assuming that its right meaning must correspond exactly with the strict and original sense of the verb represent, the Sophist persuades the multitude, that a member of the House of Commons is bound to be guided in all points by the opinion of his constituents; and, in short, to be merely their *spokesman:* whereas law and custom, which in this case may be considered as fixing the meaning of the term, require no such thing, but enjoin the representative to act according to the best of his *own* judgment, and on his own responsibility. H. Tooke has furnished a whole magazine of such weapons for any Sophist who may need them, and has furnished some specimens of the employment of them.

§ 9. It is to be observed, that to the head of *Ambiguous middle* should be referred what is called *Fallacia Plurium Interrogationum,*" which may very properly be named, simply, "the Fallacy of Interrogation;" *viz.* the Fallacy of asking several questions which appear to be but one; so that whatever *one* answer is given, being of course applicable to one only of the implied questions, may be interpreted as applied to the other; the refutation is, of course, to reply *separately* to each question, *i.e.* to detect the ambiguity.

We have said several "questions which *appear to be but one,*" for else there is no *Fallacy;* such an example, therefore, as "*estne homo animal et lapis?*" which Aldrich gives, is foreign to the matter in hand; for there is nothing unfair in asking two distinct questions, or asserting two distinct propositions, *distinctly and avowedly.*

This Fallacy may be referred, as has been said, to the head of *Ambiguous middle:* in all Reasoning it is very common to state one of the Premises in form of a question, and when that is admitted, or supposed to be admitted, then to fill up the rest; if then one of the terms of that question be ambiguous, whichever sense the opponent replies to, the Sophist assumes the *other* sense of the term in the remaining Premiss. It is therefore very common to state an unequivocal argument, in form of a question so worded, that there shall be *little doubt which* reply will be given: but if there *be* such doubt, the Sophist must have *two* Fallacies of equivocation ready: *e.g.* the question "whether any thing vicious is expedient," discussed in Cic. *Off.*, Book III. (where, by the bye, he seems not a little perplexed with it himself,) is of the character in question, from the ambiguity of the word "*expedient,*" which means sometimes, "conducive to temporal prosperity," sometimes, "conducive to the greatest good:" whichever answer therefore was given, the Sophist might have a Fallacy of equivocation founded on this term; *viz.* if the answer be in the negative, his argument Logically developed, will stand thus,—"what is vicious is not expedient; whatever conduces to wealth and aggrandizement is expedient, therefore it cannot be vicious:" if, in the affirmative, then thus, "whatever is expedient is desirable; something vicious is expedient, therefore desirable."

This kind of Fallacy is frequently employed in such a manner, that the uncertainty shall be, not about the *meaning*, but the *extent* of a term, *i.e.* whether it is *distributed* or not: *e.g.* "did A B in this case act from such and such a motive?" which may imply either, "was it his *sole* motive?" or "was it one of his motives?" in the former case the term "that which actuated A B" is distributed; in the latter not: now if he acted from a mixture of motives, whichever answer you give, may be misrepresented and thus disproved.

§ 10. In some cases of *Ambiguous middle*, the term in question may be considered as having *in itself*, from its own equivocal nature, two significations; (which apparently constitutes the "*Fallacia equivocationis* of Logical writers;) others again have a middle term which is ambiguous from the context, *i.e.* from what is *understood in conjunction* with it: this division will be found useful, though it is impossible to draw the line accurately in it.

There are various ways in which words come to have two meanings; 1st. by *accident*; (*i.e.* when there is no perceptible connection between the two meanings;) as "*light*" signifies both the contrary to "heavy," and the contrary to "dark." Thus, such proper names as John or Thomas, &c. which happen to belong to several different persons, are ambiguous, because they have a different signification in each case where they are applied. Words which fall under this first head are what are the most strictly called *equivocal*.

2dly. There are several terms in the use of which it is necessary to notice the distinction between *first* and *second intention:* the "first intention" of a term, (according to the usual acceptation of this phrase,) is a certain *vague* and *general* signification of it, as opposed to one more *precise* and *limited*, which it bears in some particular art, science, or system, and which is called its "second intention." Thus, among farmers in some parts, the word "beast" is applied particularly and especially to the ox kind; and "bird," in the language of many sportsmen, is in like manner appropriated to the partridge: the common and general acceptation (which every one is well acquainted with) of each of those two words, is the first intention of each; the other, its second intention.

It is evident that a term may have several second intentions, according to the several systems into which it is introduced, and of which it is one of the technical terms: thus line signifies, in the Art Military, a certain form of drawing up ships or troops; in Geography, a certain division of the earth; to the fisherman, a string to catch fish, &c. &c.; all which are so many distinct second intentions, in each of which there is a certain signification of "extension in length" which constitutes the first intention, and which corresponds pretty nearly with the employment of the term in Mathematics.

It will sometimes happen, that a term shall be employed always in some one or other of its second intentions; and never, strictly, in the

first, though that first intention is a *part of its signification* in each case. It is evident, that the utmost care is requisite to avoid confounding together, either the first and second intentions, or the different second intentions with each other.

3dly. When two or more things are connected by *resemblance* or *analogy*, they will frequently have the same name. Thus a "*blade* of grass," and the contrivance in building called a "*dove-tail*," are so called from their *resemblance* to the *blade*[7] of a sword, and the *tail* of a real dove: but two things may be connected by *analogy*, though they have in *themselves* no *resemblance:* for analogy is the resemblance of *ratios*, (or relations,) thus,—as a *sweet* taste *gratifies* the palate, so does a *sweet* sound *gratify* the ear; and hence the same word, "*sweet*," is applied to both, though no flavour can resemble a sound in itself: so, the *leg of a table*, does not resemble that of an animal; nor the foot of a mountain that of an animal: but *the leg answers the same purpose* to the table, as the leg of an animal to that animal; the foot of a mountain has the *same situation* relatively to the mountain, as the foot of an animal, to the animal; this analogy, therefore, may be expressed like a Mathematical analogy; (or proportion) leg : animal : : supporting-stick : table.—In all these cases, (of this 3d head,) one of the meanings of the word is called by Logicians *proper*, *i.e.* original or primary; the other, *improper*, secondary or transferred: thus, *sweet*, is originally and properly applied to *tastes;* secondarily and *improperly*, (*i.e.* by analogy,) to sounds: thus also, dove-tail is applied secondarily, though not by analogy, but by direct resemblance, to the contrivance in building so called. When the secondary meaning of a word is founded on some *fanciful* analogy, and especially when it is introduced for ornament sake, we call this a *metaphor;* as when we speak of "a ship's *ploughing* the deep." The turning up of the surface being essential indeed to the plough, but incidental only to the ship; but if the analogy be a more important and essential one, and especially if we have no other word to express our meaning but this transferred one, we then call it *merely* an *analogous* word, (though the *metaphor* is analogous also;) *e.g.* one would hardly call it *metaphorical* or *figurative* language to speak of the leg of a table, or mouth of a river.

4thly. Several things may be called by the same name, (though they have no connection of resemblance or analogy,) from being *connected by vicinity of time or place;* under which head will come the connection of *cause and effect*, or of part and whole, &c. Thus a *door* signifies both an opening in the wall, (more strictly called the door-way,) and a board which closes it: which are things neither similar nor analogous. When I say, "the rose *smells* sweet," and "I

[7] Unless, indeed, the primary application of the term be to the leaf of grass, and the secondary, to cutting instruments; which is perhaps more probable; but the question is unimportant in the present case.

smell the rose:" the word "smell" has two meanings: in the latter sentence, I am speaking of a certain *sensation* in my own mind; in the former, of a certain *quality* in the flower, which produces that sensation, but which of course cannot in the least resemble it: and here the word *smell*, is applied with equal propriety to both. Thus we speak of Homer, for "the works of Homer;" and this is a secondary or transferred meaning: and so it is when we say, "a good shot," for a good marksman: but the word "*shot*" has two other meanings, which are both equally proper; *viz. the thing put into a gun* in order to be discharged from it, and the *act* of discharging it.

Thus, "*learning*" signifies either the act of acquiring knowledge, or the knowledge itself; *e.g.* "he neglects his learning." "Johnson was a man of learning." *Possession* is ambiguous in the same manner; and a multitude of others. Much confusion often arises from ambiguity of this kind, when unperceived; nor is there any point in which the copiousness and consequent precision of the Greek language is more to be admired than in its distinct terms for expressing an act, and the result of that act; *e.g.* πρᾶξις, "the doing of any thing;" πρᾶγμα, "the thing done;" so, δόσις and δῶρον, λῆψις and λῆμμα, &c. It will very often happen, that two of the meanings of a word will have no connection with one another, but will each have some connection with a third. Thus "martyr," originally signified a *witness*, thence it was applied to those who *suffered* in bearing testimony to Christianity; and thence again it is often applied to sufferers in general: the first and third significations are not the least connected. Thus "*post*" signifies originally a pillar, (*pôstum*, from *pono;*) then a distance marked out by posts; and then the carriages, messengers, &c. that travelled over this distance.

Innumerable other ambiguities might be brought under this fourth head, which indeed comprehends all the cases which do not fall under the three others.

The remedy for ambiguity is a definition of the term which is suspected of being used in two senses; *viz.* a verbal, not necessarily a real definition; as was remarked in the Compendium.

But here it may be proper to remark, that for the avoiding of Fallacy or of verbal controversy, it is only requisite that the term should be employed uniformly in the same sense *as far as the existing question is concerned.* Thus, two persons might, in discussing the question, whether Buonaparte was a GREAT man, have some difference in their acceptation of the epithet "great," which would be non-essential to that question; *e.g.* one of them might understand by it nothing more than eminent intellectual and moral *qualities;* while the other might conceive it to imply the performance of splendid *actions:* this abstract difference of meaning would not produce any disagreement in the existing question, because both those circumstances are united in the case of Buonaparte; but if one of the parties understood

the epithet "great" to imply GENEROSITY of character, &c. then there *would* be a disagreement. Definition, the specific for ambiguity, is to be employed and demanded with a view to this principle; it is sufficient on each occasion to define a term *as far as regards the question in hand.*

Of those cases in which the ambiguity arises *from the context*, there are many species; several of which Logicians have enumerated, but have neglected to refer them, in the first place, to one common class, (*viz.* the one under which they are here placed;) and have even arranged some under the head of Fallacies "*in dictione*," and others, "*extra dictionem.*"

We may consider, as the first of these species, the Fallacy of "Division" and that of "Composition," taken together, since in each of these the middle term is used in one Premiss *collectively*, in the other, *distributively:* if the former of these is the major Premiss, and the latter the minor, this is called the "Fallacy of division;" the term which is first taken collectively being afterwards divided; and *vice versâ.* The ordinary examples are such as these; all the angles of a triangle are equal to two right angles: A B C, is an angle of a triangle; therefore A B C, is equal to two right angles. Five is one number; three and two are five; therefore three and two are one number: or, three and two are two numbers, five is three and two, therefore five is two numbers: it is manifest that the middle term, three and two, (in this last example,) is ambiguous, signifying, in the major Premiss, "taken distinctly," in the minor, "taken together:" and so of the rest.

To this head may be referred the Fallacy by which men have sometimes been led to admit, or pretend to admit, the doctrine of necessity; *i.e.* he who necessarily goes or stays (*i.e.* in reality, "who *necessarily goes*, or who *necessarily stays*") is not a free agent; you must necessarily go or stay; (*i.e.* "you must necessarily *take the alternative*,") therefore you are not a free agent. Such also is the Fallacy which probably operates on most adventurers in lotteries; *e.g.* the gaining of a high prize is no uncommon occurrence; and what is no uncommon occurrence may reasonably be expected; therefore the gaining of a high prize "may reasonably be expected:" the conclusion when applied to the individual, (as in practice it is,) must be understood in the sense of "reasonably expected *by a certain individual;*" therefore for the major Premiss to be true, the middle term must be understood to mean, "no uncommon occurrence to some one *particular* person;" whereas for the minor (which has been placed first) to be true, you must understand it of "no uncommon occurrence to *some one or other;*" and thus you will have the Fallacy of Composition.

There is no Fallacy more common, or more likely to deceive than the one now before us: the form in which it is most usually employed, is, to establish some truth, *separately*, concerning *each single* member

of a certain class, and thence to infer the same of the *whole collectively:* thus some infidels have laboured to prove concerning *some one* of our Lord's miracles, that it might have been the result of an accidental conjuncture of natural circumstances; next, they endeavour to prove the same concerning *another;* and so on; and thence infer that *all* of them might have been so. They might argue in like manner, that because it is not very improbable one may throw sixes in any one out of a hundred throws, therefore it is no more improbable that one may throw sixes a hundred times running.

This Fallacy may often be considered as turning on the ambiguity of the word "all;" which may easily be dispelled by substituting for it the word "each" or "every," where that is its signification; *e.g.* "all these trees make a thick shade" is ambiguous, meaning, either "every one of them," or "all together."

This is a Fallacy with which men are extremely apt to deceive *themselves:* for when a multitude of particulars are presented to the mind, many are too weak or too indolent to take a comprehensive view of them; but confine their attention to each single point, by turns; and then decide, infer, and act, accordingly; *e.g.* the imprudent spendthrift, finding that he is able to afford this, *or* that, *or* the other expense, forgets that *all of them together* will ruin him.

To the same head may be reduced that fallacious reasoning by which men vindicate themselves to their own conscience and to others, for the neglect of those *undefined* duties, which, though indispensable, and therefore not left to our choice *whether* we will practise them or not, are left to our discretion as to the *mode,* and the particular occasions of practising them; *e.g.* "I am not bound to contribute to this charity in particular; nor to that; nor to the other:" the *practical* conclusion which they draw, is, that *all* charity may be dispensed with.

As men are apt to forget that any two circumstances (not naturally connected) are more rarely to be met with combined than separate, though they be not at all incompatible; so also they are apt to imagine from finding that they *are* rarely combined, that there is an incompatibility; *e.g.* if the chances are ten to one against a man's possessing strong reasoning powers, and ten to one against exquisite taste, the chances against the combination of the two (supposing them neither connected nor opposed) will be a hundred to one. Many therefore, from finding them so rarely united, will infer that they are in some measure incompatible; which Fallacy may easily be exposed in the form of Undistributed middle: "qualities unfriendly to each other are rarely combined; excellence in the reasoning powers and in taste are rarely combined; therefore they are qualities unfriendly to each other."

§ 11. The other kind of ambiguity arising from the context, and which is the last case of Ambiguous middle that we shall notice, is the "*fallacia accidentis,*" together with its converse "*fallacia a dicto*

secundum quid ad dictum simpliciter;" in each of which the middle is used in one Premiss to signify something considered simply, in itself, and as to its essence; and in the other Premiss, so as to imply that its accidents are taken into account with it: as in the well-known example, "what is bought in the market is eaten; raw meat is bought in the market; therefore raw meat is eaten." Here the middle has understood in conjunction with it, in the major Premiss, "*as to its substance merely:*" in the minor, "*as to its condition and circumstances.*"

To this head perhaps, as well as to any, may be referred the Fallacies which are frequently founded on the occasional, partial, and temporary variations in the acceptation of some term, arising from circumstances of person, time, and place, which will occasion something to be understood in conjunction with it beyond its strict literal signification; *e.g.* the phrase "Protestant ascendancy," having become a kind of watch-word or gathering-cry of a party, the expression of good wishes for it would commonly imply an adherence to certain measures not literally expressed by the words; to assume therefore that one is unfriendly to "Protestant ascendancy" in the literal sense, because he has declared himself unfriendly to it when implying and connected with such and such other sentiments, is a gross Fallacy; and such an one as perhaps the authors of the above would much object to, if it was assumed of *them* that they were adverse to "the cause of liberty throughout the world," and to "a fair representation of the people," from their objecting to join with the members of a factious party in the expression of such sentiments.

Such Fallacies may fairly be referred to the present head.

§ 12. Of the Non-logical (or material) Fallacies, and first of begging the question.

The indistinct and unphilosophical account which has been given by Logical writers of the Fallacy of "*non-causâ,*" and that of "*petitio principii,*" makes it very difficult to ascertain wherein they conceived them to differ, and what, according to them, is the nature of each; without therefore professing to conform exactly to their meaning, and with a view to distinctness only, which is the main point, let us confine the name "*petitio principii*" to those cases in which the Premiss either appears manifestly to be the same as the Conclusion, or is actually proved from the Conclusion, or is such as would naturally and properly so be proved; (as if one should attempt to prove the being of a God from the authority of holy writ;) and to the other class be referred all other cases, in which the Premiss (whether the expressed or the suppressed one) is either proved false, or has no sufficient claim to be received as true. Let it however be observed, that in such cases (apparently) as this, we must not too hastily pronounce the argument fallacious; for it may be perfectly fair at the *commencement* of an argument to assume a Premiss that is not more evident than the Conclusion, or is even ever so paradoxical, provided

you proceed to prove fairly that Premiss: and in like manner it is both usual and fair to *begin* by deducing your Conclusion from a Premiss exactly equivalent to it; which is merely throwing the proposition in question into the form in which it will be most conveniently proved. Arguing in a circle however must necessarily be unfair; though it frequently is practised undesignedly; *e.g.* some Mechanicians attempt to prove, (what they ought to lay down as a probable but doubtful hypothesis,) that every particle of matter gravitates equally; "why?" because those bodies which contain more particles ever gravitate more strongly, *i.e.* are heavier: "but (it may be urged) those which are heaviest are not always more bulky;" "no, but still they contain more particles, though more closely condensed;" "how do you know that?" "because they are heavier;" "how does that prove it?" "because all particles of matter gravitating equally, that mass which is specifically the heavier, must needs have the more of them in the same space."

Obliquity and disguise being of course most important to the success of the *petitio principii*, as well as of other Fallacies, the Sophist will in general either have recourse to the circle, or else not venture to *state* distinctly his assumption of the point in question, but will rather assert some other proposition which *implies* it; thus keeping out of sight (as a dexterous thief does stolen goods) the point in question, at the very moment when he is taking it for granted: hence the frequent union of this Fallacy with "*ignoratio elenchi:*" vide § 14. The English language is perhaps the more suitable for the Fallacy of *petitio principii*, from its being formed from two distinct languages, and thus abounding in synonymous expressions which have no resemblance in sound, and no connection in etymology; so that a Sophist may bring forward a proposition expressed in words of Saxon origin, and give as a reason for it, the very same proposition stated in words of Norman origin; *e.g.* "to allow every man an unbounded freedom of speech, must always be, on the whole, advantageous to the State; for it is highly conducive to the interest of the community, that each individual should enjoy a liberty perfectly unlimited of expressing his sentiments."

§ 13. The next head is, the falsity, or at least, undue assumption of a Premiss when it is not equivalent to, or dependent on the Conclusion; which, as has been before said, seems to correspond nearly with the meaning of Logicians, when they speak of "*non causa pro causâ:*" this name indeed would seem to apply a much narrower class, there being one species of arguments which are *from cause to effect*, in which of course two things are necessary; 1st. the *sufficiency* of the cause, 2d. its establishment; these are the two Premises; if therefore the *former* be unduly assumed, we are arguing from that which is *not* a sufficient cause as if it *were* so; *e.g.* as if one should contend from such a man's having been unjust or cruel, that he will

certainly be visited with some heavy temporal judgment, and come to an untimely end. In this instance the Sophist, from having assumed in the Premiss, the (granted) existence of a pretended cause, infers in the conclusion the existence of the pretended effect, which we have supposed to be the Question: or *vice versâ*, the pretended effect may be employed to establish the cause; *e.g.* inferring sinfulness from temporal calamity: but when *both* the pretended cause, and effect are *granted*, *i.e.* granted to exist, then the Sophist will infer something from their pretended *connection*; *i.e.* he will assume as a Premiss, that "of these two admitted facts, the one is the cause of the other;" as the opponents of the Reformation assumed that it was the cause of the troubles which took place at that period, and thence inferred that it was an evil. Such an argument as either of these might strictly be called "*non causa pro causâ*;" but it is not probable that the Logical writers intended any such limitation, (which indeed would be wholly unnecessary and impertinent,) but rather that they were confounding together *cause and reason;* the sequence of *Conclusion* from *Premises* being perpetually mistaken for that of *effect* from physical *cause*. It is indeed a very necessary caution in *philosophical investigation* not to assume too hastily that one thing is the *cause* of another, when perhaps it is only an *accidental concomitant;* (as was the case in the assumption of the Premises of the last mentioned examples:) but *investigation* is a perfectly distinct business from *argumentation;* and to mingle together the rules of the two, (as Logical writers have generally done, especially in the present case,) tends only to produce confusion in both. It may be better therefore to drop the name which tends to perpetuate this confusion, and simply state (when such is the case) that the Premiss is unduly assumed; *i.e.* without being either self-evident, or satisfactorily proved.

The contrivances by which men may deceive themselves or others, in assuming Premises unduly, *so that that undue assumption shall not be perceived*, (for it is in *this* the *Fallacy* consists) are of course infinite. Sometimes (as was before observed) the *doubtful Premiss* is *suppressed*, as if it were too evident to need being proved, or even stated, and as if the whole question turned on the establishment of the other Premiss.

Thus H. Tooke proves, by an immense induction, that all particles were originally nouns or verbs; and thence concludes, that in reality they are so still, and that the ordinary division of the parts of speech is absurd; keeping out of sight, as self-evident, the other Premiss, which is absolutely false; *viz.* that the meaning and force of a term, now and for ever, must be that, which it, or its root originally bore.

Sometimes men are shamed into admitting an unfounded assertion, by being assured, that it is so evident it would argue great weakness to doubt it. In general, however, the more skilful Sophist will avoid a *direct assertion* of what he means unduly to assume;

since that might direct the reader's attention to the consideration of the question whether it be *true* or not, since that which is indisputable does not so often need to be asserted: it succeeds better, therefore, if you *allude* to the proposition as something *curious* and remarkable; just as the Royal Society were imposed on by being asked to *account for* the fact that a vessel of water received no addition to its weight by a live fish put into it; while they were seeking for the *cause*, they forgot to ascertain the *fact*, and thus admitted without suspicion a mere fiction. Thus an eminent Scotch writer, instead of *asserting* that "the advocates of Logic have been worsted and driven from the field in every controversy," (an assertion, which if made, would have been the more readily ascertained to be perfectly groundless,) merely *observes*, that "it is a circumstance not a little *remarkable*."

Frequently the Fallacy of *ignoratio elenchi* is called in to the aid of this; *i.e.* the Premiss is assumed on the ground of another proposition, *somewhat like it*, having been proved; thus in arguing by example, &c. the parallelism of two cases is often assumed from their being in *some respects* alike, though perhaps they differ in the very point which is *essential* to the argument; *e.g.* from the circumstance that some men of humble station, who have been well educated, are apt to think themselves above low drudgery, it is argued that universal education of the lower order, would beget general idleness: this argument rests of course on the assumption of *parallelism* in the two cases, *viz.* the past and the future; whereas there is a circumstance that is absolutely essential, in which they differ; for when education is *universal* it must cease to be a *distinction;* which is probably the very circumstance that renders men too proud for their work.

This very same Fallacy is often resorted to on the opposite side; an attempt is made to invalidate some argument from example, by pointing out a difference between the two cases, though they agree in every thing that is essential to the question. Lastly, it may be here remarked, conformably with what has been formerly said, that it will often be left to your choice whether to refer this or that fallacious argument to the present head, or that of Ambiguous middle; "*if* the middle term is here used in *this* sense, there is an *ambiguity; if* in *that* sense, the proposition is *false*."

§ 14. The last kind of Fallacy to be discussed is that of Irrelevant Conclusion, commonly called *ignoratio elenchi*. Various kinds of propositions are, according to the occasion, substituted for the one of which proof is required.

Sometimes the particular for the universal; sometimes a proposition with different terms: and various are the contrivances employed to effect and to conceal this substitution, and to make the Conclusion which the Sophist has drawn, answer, practically, the same purpose as the one he *ought* to have established. We say, "practically the same purpose," because it will very often happen that some *emotion*

will be excited—some sentiment impressed on the mind—(by a dexterous employment of this Fallacy) such as shall bring men into the *disposition* requisite for your purpose, though they may not have assented to, or even stated distinctly in their own minds the *proposition* which it was your business to establish. Thus if a Sophist has to defend one who has been guilty of some *serious* offence, which he wishes to extenuate, though he is unable distinctly to prove that it is not such, yet if he can succeed in *making the audience laugh* at some casual matter, he has gained practically the same point. So also if any one has pointed out the extenuating circumstances in some particular case of offence, so as to show that it differs widely from the generality of the same class, the Sophist, if he find himself unable to disprove these circumstances, may do away the force of them, by simply *referring the action to that very class*, which no one can deny that it belongs to, and the very name of which will excite a feeling of disgust sufficient to counteract the extenuation; *e.g.* let it be a case of peculation, and that many mitigating circumstances have been brought forward which cannot be denied; the sophistical opponent will reply, "well, but after all, the man is a *rogue*, and there is an end of it;" now in reality this was (by hypothesis) never the question; and the mere assertion of what was never denied, *ought* not, in fairness, to be regarded as decisive; but, practically, the odiousness of the word, arising in great measure from the *association of those very circumstances* which belong to *most of the class*, but which we have supposed to be *absent* in *this particular* instance, excites precisely that *feeling of disgust*, which in effect destroys the force of the defence. In like manner we may refer to this head all cases of improper appeals to the passions, and every thing else which is mentioned by Aristotle as extraneous to the matter in hand, (ἔξω τοῦ πράγματος.)

In all these cases, as has been before observed, if the Fallacy we are now treating of be employed for the apparent establishment, not of the *ultimate* Conclusion, but (as it very commonly happens) of a *Premiss*, (*i.e.* if the Premiss required be assumed on the ground that some proposition resembling it has been proved,) then there will be a combination of this Fallacy with the last mentioned. A good instance of the employment and exposure of this Fallacy occurs in Thucydides, in the speeches of Cleon and Diodotus concerning the Mitylenæans: the former (over and above his appeal to the angry passions of his audience,) urges the *justice* of putting the revolters to death; which, as the latter remarked, was nothing to the purpose, since the Athenians were not sitting in *judgment*, but in *deliberation*, of which the proper end is *expediency*.

It is evident that *ignoratio elenchi* may be employed as well for the apparent *refutation* of your opponent's proposition, as for the apparent establishment of your own; for it is substantially the same thing to *prove* what was not denied, or to *disprove* what was not asserted:

the latter practice is not less common, and it is more offensive, because it frequently amounts to a personal affront, in attributing to a person opinions, &c. which he perhaps holds in abhorrence. Thus, when in a discussion one party vindicates, on the ground of general expediency, a particular instance of resistance to Government in a case of intolerable oppression, the opponent may gravely maintain that "we ought not to do evil that good may come:" a proposition which of course had never been denied, the point in dispute being "whether resistance in this particular case *were* doing evil or not." In this example it is to be remarked, (and the remark will apply very generally,) that the Fallacy of *petitio principii* is combined with that of *ignoratio elenchi*, which is a very common and successful practice; *viz.* the Sophist proves, or disproves, not the proposition which is really in question, but one which so implies it as to proceed on the supposition that it is already decided, and can admit of no doubt; by this means his "assumption of the point in question" is so indirect and oblique, that it may easily escape notice; and he thus establishes, practically, his Conclusion, at the very moment when he is withdrawing your attention from it to another question.

There are certain kinds of argument recounted and named by Logical writers, which we should by no means universally call Fallacies; but which *when unfairly* used, and *so far as they* are fallacious, may very well be referred to the present head; such as the "*argumentum ad hominem*," or personal argument, "*argumentum ad verecundiam*," "*argumentum ad populum*," &c. all of them regarded as contradistinguished from "*argumentum ad rem*," or according to others (meaning probably the very same thing) "*ad judicium.*" These have all been described in the lax and popular language before alluded to, but not scientifically: the "*argumentum ad hominem*" they say, "is addressed to the peculiar circumstances, character, avowed opinions, or past conduct of the individual, and therefore has a reference to him only, and does not bear directly and absolutely on the real question, as the '*argumentum ad rem*' does:" in like manner the "*argumentum ad verecundiam*" is described as an appeal to our reverence for some respected authority, some venerable institution, &c. and the "*argumentum ad populum*," as an appeal to the prejudices, passions, &c. of the multitude, and so of the rest. Along with these is usually enumerated "*argumentum ad ignorantiam*," which is here omitted as being evidently nothing more than the employment of some kind of Fallacy, in the widest sense of that word, towards such as are likely to be deceived by it. It appears then, (to speak rather more technically,) that in the "*argumentum ad hominem*" the Conclusion which actually is established, is not the absolute and general one in question, but relative and particular; *viz.* not that "such and such is the fact," but that "*this man* is bound to admit it, in conformity to his principles of Reasoning, or in consistency with his

own conduct, situation, &c." Such a Conclusion it is often both fair and necessary to establish, in order to silence those who will not yield to fair general argument; or to convince those whose weakness and prejudices would not allow them to assign to it its due weight: it is thus that our Lord on many occasions silences the cavils of the Jews; as in the vindication of healing on the Sabbath, which is paralleled by the authorized practice of drawing out a beast that has fallen into a pit. All this, as we have said, is perfectly fair, provided it be done plainly, *knowingly*, and *avowedly;* but if you attempt to *substitute* this partial and relative Conclusion for a more general one—if you triumph as having established your proposition absolutely and universally, from having established it, in reality, only as far as it relates to your opponent, then you are guilty of a fallacy of the kind which we are now treating of: your Conclusion is not in reality that which was, by your own account, proposed to be proved: the fallaciousness depends upon the *deceit* or attempt to deceive. The same observations will *apply* to "*argumentum ad verecundiam*," and the rest.

It is very common to employ an ambiguous term for the purpose of introducing the Fallacy of Irrelevant Conclusion; *i.e.* when you cannot prove your proposition in the sense in which it was maintained, to prove it in some other sense; *e.g.* those who contend against the efficacy of *faith*, usually employ that word in their arguments in the sense of mere belief, unaccompanied with any moral or practical result, but considered as a mere intellectual process; and when they have thus proved their conclusion, they oppose it to one in which the word is used in a widely different sense.

§ 15. The Fallacy of *ignoratio elenchi* is no where more common than in protracted controversy, when one of the parties, after having attempted in vain to maintain his position, *shifts his ground* as covertly as possible to another, instead of honestly giving up the point. An instance occurs in an attack made on the system pursued at one of our Universities. The objectors finding themselves unable to maintain their charge of the *present* neglect of Mathematics in that place, (to which neglect they had attributed the late *general decline* in those studies,) they shifted their ground, and contended that that University was *never* famous for Mathematicians; which not only does not establish, but absolutely overthrows their own original assertion; for if it *never* succeeded in those pursuits, it could not have caused their late *decline*.

A practice of this nature is common in oral controversy especially; *viz.* that of combating *both* your opponent's Premises *alternately*, and shifting the attack from the one to the other, without waiting to have either of them decided upon before you quit it.

It has been remarked above, that one class of the propositions that may be, in this Fallacy, substituted for the one required, is the

particular for the *universal:* nearly akin to this is the very common case of proving something to be *possible* when it ought to have been proved highly *probable;* or *probable*, when it ought to have been proved *necessary;* or, which comes to the very same, proving it to be *not necessary*, when it should have been proved *not probable;* or *improbable*, when it should have been proved *impossible.* Aristotle (*in Rhet.* Book II.) complains of this last branch of the Fallacy, as giving an undue advantage to the respondent: many a guilty person owes his acquittal to this; the jury considering that the evidence brought does not demonstrate the absolute impossibility of his being innocent, though perhaps the chances are innumerable against it.

§ 16. Similar to this case is that which may be called the *Fallacy of objections; i.e.* showing that *there are* objections against some plan, theory or system, and thence inferring that it should be rejected; when that which ought to have been proved, is, that there are *more*, or *stronger* objections against the receiving than the rejecting of it. This is the main, and almost universal Fallacy of infidels, and is that of which men should be first and principally warned. This is also the stronghold of bigoted anti-innovators, who oppose all reforms and alterations indiscriminately; for there never was, nor will be, any plan executed or proposed, against which strong and even unanswerable objections may not be urged; so that unless the opposite objections be set in the balance on the other side, we can never advance a step. "There are objections," said Dr. Johnson, "against a *plenum*, and objections against a *vacuum;* but one of them must be true."

The very same Fallacy indeed is employed on the other side, by those who are for overthrowing whatever is established as soon as they can prove an objection against it, without considering whether more and weightier objections may not lie against their own schemes: but their opponents have this decided advantage over them, that they can urge with great plausibility, "we do not call upon you to *reject* at once whatever is objected to, but merely to *suspend your judgment* and not come to a decision as long as there are reasons on both sides:" now since there always *will be* reasons on both sides, this *non*-decision is practically the very same thing as a *decision in favour of the existing state* of things; the *delay* of trial becomes equivalent to an *acquittal.*[8]

§ 17. Another form of *ignoratio elenchi*, which is also rather the most serviceable on the side of the respondent, is, to prove or disprove *some part* of that which is required, and dwell on *that*, suppressing all the rest.

[8] "Not to resolve, is to resolve."—BACON.

How happy it is for mankind that in the most momentous concerns of life their decision is generally formed *for* them by external circumstances; which thus saves them not only from the perplexity of doubt and the danger of delay, but also from the pain of regret, since we acquiesce much more cheerfully in that which is unavoidable.

Thus, if a University is charged with cultivating *only* the mere elements of Mathematics, and in reply a list of the books studied there is produced, should even *any one* of those books be *not elementary*, the charge is in fairness refuted; but the Sophist may then earnestly contend that *some* of those books *are* elementary; and thus keep out of sight the real question, *viz.* whether they are *all* so.

Hence the danger of ever advancing more than can be well maintained; since the refutation of *that* will often quash the whole: a guilty person may often escape by having too much laid to his charge: so he may also by having too much evidence against him, *i.e.* some that is not in itself satisfactory: thus, a prisoner may sometimes obtain acquittal by showing that one of the witnesses against him is an infamous informer and spy; though perhaps if that part of the evidence had been omitted, the rest would have been sufficient for conviction.

Cases of this nature might very well be referred also to the Fallacy formerly mentioned, of inferring the Falsity of the Conclusion from the Falsity of a Premiss, which indeed is very closely allied to the present Fallacy: the real question is "whether or not this Conclusion *ought to be admitted;*" the Sophist confines himself to the question, "whether or not it is *established by this particular argument;*" leaving it to be inferred by the audience, if he has carried his point as to the latter question, that the former is thereby decided.

§ 18. It will readily be perceived that nothing is less conducive to the success of the Fallacy in question than to state clearly, in the outset, either the proposition you are about to prove, or that which you ought to prove; it answers best to *begin* with the *Premises*, and to introduce a pretty long chain of argument before you arrive at the Conclusion. The careless hearer takes for granted, at the beginning, that this chain will lead to the conclusion required; and by the time you are come to the end, he is ready to take for granted that the Conclusion which you draw *is* the one required; his idea of the question having gradually become indistinct. This Fallacy is greatly aided by the common practice of suppressing the Conclusion and leaving it to be supplied by the hearer, who is of course less likely to perceive whether it be really that "which was to be proved," than if it were distinctly stated. The practice therefore is at best suspicious; and it is better in general to avoid it, and to give and require a distinct statement of the Conclusion intended.

§ 19. Before we dismiss the subject of Fallacies, it may not be improper to mention the just and ingenious remark, that Jests are Fallacies; *i.e.* Fallacies so palpable as not to be likely to deceive any one, but yet bearing just that resemblance of argument which is calculated to amuse by the contrast; in the same manner that a parody does, by the contrast of its levity with the serious production which it imitates. There is indeed something laughable even in Fallacies

which are intended for serious conviction, when they are thoroughly exposed. There are several different kinds of joke and raillery, which will be found to correspond with the different kinds of Fallacy: the pun (to take the simplest and most obvious case) is evidently a mock argument founded on a palpable equivocation of the middle term: and the rest in like manner will be found to correspond to the respective Fallacies, and to be *imitations* of serious argument. It is probable indeed that all jests, sports, or games, (παιδιαι) properly so called, will be found, on examination, to be *imitative* of serious transactions: but to enter fully into this subject would be unsuitable to the present occasion.

We shall conclude the consideration of this subject with some general remarks on the legitimate province of Reasoning, and on its connection with Inductive philosophy, and with Rhetoric: on which points much apprehension has prevailed, tending to throw obscurity over the design and use of the Science under consideration.

ESSAY

ON THE PROVINCE OF REASONING.

Logic being concerned with the theory of Reasoning, it is evidently necessary, in order to take a correct view of this Science, that all misapprehensions should be removed, relative to the occasions on which the Reasoning process is employed, the purposes it has in view, and the limits within which it is confined.

Simple and obvious as such questions may appear to those who have not thought much on the subject, they will appear on further consideration to be involved in much perplexity and obscurity, from the vague and inaccurate language of many popular writers. To the confused and incorrect notions that prevail respecting the Reasoning process, may be traced most of the common mistakes respecting the Science of Logic, and much of the unsound and unphilosophical argumentation which is so often to be met with in the works of ingenious writers.

These errors have been incidentally adverted to in the foregoing part of this article; but it may be desirable, before we dismiss the subject, to offer on these points some further remarks, which could not have been there introduced without too great an interruption to the development of the system. Little or nothing, indeed, remains to be said, that is not *implied* in the principles which have been already laid down; but the results and applications of those principles are liable in many instances to be overlooked if not distinctly pointed out. These supplementary observations will neither require, nor admit of, so systematic an arrangement as has hitherto been arrived at, as they will be such as are suggested principally by the objections and mistakes of those who have misunderstood, partially, or entirely, the nature of the Logical system.

Of Induction.

§ 1. Much has been said by some writers of the superiority of the Inductive to the Syllogistic method of seeking truth, as if the two stood opposed to each other; and of the advantage of substituting the Organon of Bacon for that of Aristotle, &c. &c., which indicates a total misconception of the nature of both. There is, however, the more excuse for the confusion of thought which prevails on this subject, because eminent Logical writers have treated, or at least have appeared to treat, of Induction as a distinct kind of argument

from the Syllogism; which if it were, it certainly might be contrasted with the Syllogism: or rather the whole Syllogistic theory would fall to the ground, since one of the very first principles it establishes, is that all Reasoning, on whatever subject, is one and the same process, which may be clearly exhibited in the form of Syllogisms. It is hardly to be supposed, therefore, that this was the meaning of those writers; though it must be admitted that they have countenanced the error in question, by their inaccurate expressions. This inaccuracy seems chiefly to have arisen from a vagueness in the use of the word Induction, which is sometimes employed to designate the process of investigation and of collecting facts; sometimes the deducing of an inference from those facts. The former of these processes (*i.e.* that of observation and experiment) is undoubtedly *distinct* from that which takes place in the Syllogism; but then it is not a process of *argument;* the latter again *is* an argumentative process; but then it is, like all other arguments, capable of being Syllogistically expressed. And hence Induction has come to be regarded as a distinct kind of argument from the Syllogism. This Fallacy cannot be more concisely or clearly stated, than in the technical form with which we may now presume our readers to be familiar.

Induction is distinct from Syllogism:
Induction is a process of Reasoning; therefore
There is a process of Reasoning distinct from Syllogism.

Here, "Induction," which is the middle term, is used in different senses in the two Premises.

In the process of Reasoning by which we deduce, from our observation of certain known cases, an inference with respect to unknown ones, we are employing a Syllogism in *Barbara* with the major[1] Premiss suppressed; that being always substantially the same, as it asserts that "what belongs to the individual or individuals we have examined, belongs to the whole class under which they come:" *e.g.* from an examination of the history of several tyrannies, and finding that each of them was of short duration, we conclude that "the same is likely to be the case with all tyrannies:" the suppressed major Premiss being easily supplied by the hearer; *viz.* "that what belongs to the tyrannies in question is likely to belong to all."

Induction, therefore, so far forth as it is an *argument*, may of course be stated Syllogistically; but so far forth as it is a *process of inquiry* with a view to obtain the Premises of that argument, it is of course out of the province of Logic Whether the Induction (in this last sense) has been sufficiently ample, *i.e.* takes in a sufficient number of individual cases,—whether the character of those cases has been correctly ascertained—and how far the individuals we have examined are *likely to resemble*, in this or that circumstance, *the rest* of the class,

[1] Not the minor, as Aldrich represents it.

&c. &c. are points that require indeed great judgment and caution; but this judgment and caution are not to be aided by Logic, because they are, in reality, employed in deciding whether or not it is fair and allowable to *lay down your Premises; i.e.* whether you are authorized or not, to assert that "what is true of the individuals you have examined, is true of the whole class:" and that this or that *is* true of those individuals. Now the rules of Logic have nothing to do with the truth or falsity of the Premises, but merely teach us to decide (not whether the Premises are *fairly laid down*, but) whether the Conclusion *follows fairly from* the Premises or not.

Whether the Premises may fairly be assumed, or not, is a point which cannot be decided without a competent knowledge of the *nature of the subject, e.g.* in Natural Philosophy, in which the circumstances which in any case affect the result, are usually far more clearly ascertained, a *single instance* is often accounted a sufficient Induction: *e.g.* having once ascertained that an individual magnet will attract iron, we are authorized to conclude that this property is universal: in the affairs of human life, a much fuller induction is required; as in the former example. In short, the *degree of evidence* for any proposition we originally assume as a Premiss, (whether the expressed, or the suppressed one,) is not to be learned from Logic, nor indeed from *any one distinct* Science; but is the province of whatever Science furnishes the subject matter of your argument. None but a Politician can judge rightly of the degree of evidence of a proposition in Politics; a Naturalist, in Natural History, &c. &c.: *e.g.* from examination of many horned animals, as sheep, cows, &c. a Naturalist finds that they have cloven feet; now his *skill as a Naturalist* is to be shown in judging whether these animals are likely to resemble in the form of their feet all other horned animals; and it is the exercise of this judgment, together with the examination of individuals, that constitutes what is usually meant by the *Inductive process;* which is that by which we gain *new truths,* and which is not connected with Logic; being not what is strictly called *Reasoning,* but *Investigation.* But when this major Premiss is *granted* him, and is combined with the minor, *viz.* that the animals he has examined have cloven feet, then he *draws the conclusion Logically: viz.* that "the feet of all horned animals are cloven." Again, if from several times meeting with ill-luck on a Friday, any one concluded that Friday, universally, is an unlucky day, one would object to his *Induction;* and yet it would not be, as an *argument, illogical;* since the conclusion *follows* fairly, *if* you *grant* his implied Premiss, that the events which happened on those particular Fridays are such as must happen on all Fridays; but we should object to his *laying down this* Premiss; and therefore should justly say that his *Induction* was faulty, though his *argument* was correct.

And here it may be remarked that the ordinary rule for fair argument, *viz.* that in an Enthymeme the suppressed Premiss should be

always the one of whose truth least doubt can exist, is not observed in Induction; for the Premiss which is usually the more doubtful of the two, is, in that, the major; it being in few cases quite certain that the individuals respecting which some point has been ascertained are to be fairly regarded as a sample of the whole class; the major Premiss nevertheless is seldom expressed, for the reason just given, that it is easily understood, as being *mutatis mutandis*, the same in every Induction.

What has been said of Induction will equally apply to Example, which differs from it only in having a singular instead of a general conclusion: *e.g.* in the instance above, if the conclusion had been drawn, not respecting tyrannies in general, but respecting this or that tyranny, that it was not likely to be lasting, each of the cases adduced to prove this, would have been called an Example.

On the Discovery of Truth.

§ 2. Whether it is by a process of Reasoning that New Truths are brought to light, is a question which seems to be decided in the negative by what has been already said, though many eminent writers seem to have taken for granted the affirmative. It is perhaps, in a great measure, a dispute concerning the use of words; but it is not for that reason either uninteresting or unimportant, since an inaccurate use of language may often, in matters of Science, lead to confusion of thought, and to erroneous conclusions. And in the present instance much of the undeserved contempt which has been bestowed on the Logical system may be traced to this source; for when any one has laid down that "Reasoning is important in the discovery of Truth," and that "Logic is of no service in the discovery of truth," each of which propositions is true in a certain sense of the terms employed, but not in the *same* sense; he is naturally led to conclude that there are processes of Reasoning to which the Syllogistic theory does not apply, and of course to misconceive altogether the nature of the Science.

In maintaining the negative side of the above question, three things are to be premised: first, that it is not contended that Discoveries of any kind of Truth can be made (or at least are usually made) *without* Reasoning; only that Reasoning is not the *whole* of the process, nor the whole of that which is important therein: secondly, that Reasoning shall be taken in the sense, not of every exercise of the Reason, but of *Argumentation*, in which we have all along used it, and in which it has been defined by all the Logical writers, *viz.* "from certain granted propositions to infer another proposition as the consequence of them:" thirdly, that by a "New Truth," be understood something neither expressly nor virtually asserted before,—not implied and involved in any thing already known.

To prove then this point demonstratively becomes in this manner

perfectly easy; for since all Reasoning (in the sense above defined) may be resolved into Syllogisms; and since even the objectors to Logic make it a subject of complaint, that in a Syllogism the Premises do virtually assert the Conclusion, it follows at once that no New Truth (as above defined) can be elicited by any process of Reasoning.

It is on this ground indeed, that the justly celebrated author of the *Philosophy of Rhetoric* objects to the Syllogism altogether, as necessarily involving a *petitio principii;* an objection which, of course, he would not have been disposed to bring forward, had he perceived that, whether well or ill founded, it lies against all arguments whatever.

Had he been aware that a Syllogism is no distinct kind of argument otherwise than in form, but is, in fact, any argument whatever stated regularly and at full length, he would have obtained a more correct view of the object of all Reasoning, which is merely to expand and unfold the assertions wrapt up, as it were, and implied in those with which we set out, and to bring a person to perceive and acknowledge the full force of that which he has admitted,—to contemplate it in various points of view,—to admit in one shape what he has already admitted in another, and to give up and disallow whatever is inconsistent with it.

Nor is it always a very easy task even to bring before the mind the several bearings,—the various applications,—of any one proposition. A common term comprehends several, often numberless individuals, and these often, in some respects, widely differing from each other; and no one can be, on each occasion of his employing such a term, attending to and fixing his mind on each of the individuals, or even of the species so comprehended. It is to be remembered too, that both Division and Generalization are in a great degree arbitrary; *i.e.* that we may both divide the same genus on several different principles, and may refer the same species to several different classes, according to the nature of the discourse and drift of the argument; each of which classes will furnish a distinct middle term for an argument, according to the question: *e.g.* if we wished to prove that "a horse feels," (to adopt an ill-chosen example from the above writer,) we might refer it to the genus "animal;" to prove that "it has only a single stomach," to the genus of "non-ruminants;" to prove that it is "likely to degenerate in a very cold climate," we should class it with "original productions of a hot climate, &c. &c." Now each of these, and numberless others to which the same thing might be referred, are implied by the very term "horse;" yet it cannot be expected that they all be at once present to the mind whenever that term is uttered. Much less, when instead of such a term as that, we are employing terms of a very abstract, and perhaps complex signification,[2] as "government, justice, &c."

[2] On this point there are some valuable remarks in the *Philosophy of Rhetoric* itself, Book IV. Ch. VII.

The ten Categories[3] or Predicaments which Aristotle and other Logical writers have treated of, being certain general heads or *summa-genera*, to one or more of which every term may be referred, serve the purpose of marking out certain tracks, as it were, which are to be pursued in searching for middle terms in each argument respectively; it being essential that we should generalize on a right principle, with a view to the question before us; or, in other words, that we should abstract that portion of any object presented to the mind, which is important to the argument in hand. There are expressions in common use which have a reference to this caution; such as "this is a question, not as to the nature of the object, but the magnitude of it:" "this is a question of time, or of place, &c.;" *i.e.* "the subject must be referred to this or to that Category."

With respect to the meaning of the terms in question, "Discovery," and "New Truth;" it matters not whether we confine ourselves to the narrowest sense, or admit the widest, provided we do but *distinguish;* there certainly *are* two kinds of "New Truth," and of "Discovery," if we take those words in the widest sense in which they are ever used. First, such Truths as were, before they were discovered, *absolutely* unknown, being not implied by any thing we previously knew, though we might perhaps suspect them as probable; such are all *matters of fact* strictly so called, when first made known to one who had not any such previous knowledge, as would enable him to ascertain them *a priori; i.e.* by Reasoning; as if we inform a man that we have a colony at Botany Bay; or that the earth is at such a distance from the sun; or that platina is heavier than gold. The communication of this kind of knowledge is most usually and most strictly called *information:* we gain it from *observation*, and from *testimony;* no *mere internal workings* of our own minds, (except when the mind itself is the very object to be observed,) or *mere* discussions in words, will make these known to us; though there is great room for sagacity *in judging what testimony to admit*, and forming *conjectures* that may *lead* to *profitable observation*, and to experiments with a view to it. The other class of Discoveries is of a very different nature; that which may be elicited by Reasoning, and consequently is implied in that which we already know, we assent to on that ground, and not from observation or testimony: to take a Geometrical truth upon *trust*, or to attempt to ascertain it by *observation*, would betray a total ignorance of the nature of the Science. In the longest demonstration the Mathematical teacher seems only to lead us to make use of our

[3] The Categories enumerated by Aristotle, are οὐσία, πόσον, ποῖον, πρὸς τι, ποῦ, πότε, κεῖσθαι, ἔχειν, ποιεῖν, πάσχειν; which are usually rendered, as adequately as perhaps they can be in our language, Substance, Quantity, Quality, Relation, Place, Time, Situation, Possession, Action, Suffering. The catalogue has been by some writers enlarged, as it is evident may easily be done by subdividing some of the heads; and by others curtailed, as it is no less evident that all may ultimately be referred to the two heads of Substance and Attribute, or in the language of some Logicians, Accident.

own stores, and point out to us how much we had already admitted; and in the case of many Ethical propositions, we assent at first hearing, though perhaps we had never heard or thought of the proposition before; so also do we readily *assent* to the *testimony* of a respectable man who tells us that our troops have gained a victory; but how different is the nature of the assent in the two cases. In the latter, we are ready to thank the person for his information, as being such as no wisdom or learning would have enabled us to ascertain; in the former we usually exclaim "*very true!*" "that is a valuable and just remark; that never *struck* me before!" implying at once our practical ignorance of it, and also our consciousness that we possess, in what we already know, the means to ascertain the truth of it.

To all practical purposes, indeed, a Truth of this description may be as completely unknown to a man as the other; but as soon as it is set before him, and the argument by which it is connected with his previous notions is made clear to him, he *recognises* it as something conformable to, and contained in his former belief.

It is not improbable that Plato's doctrine of Reminiscence arose from a hasty extension of what he had observed in this class, to all acquisition of knowledge whatever.

His Theory of ideas served to confound together *matters of fact* respecting the nature of things, (which may be perfectly new to us,) with propositions *relating to our own notions*, and modes of thought; (or to speak perhaps more correctly, our own arbitrary signs) which propositions must be contained and implied in those very complex notions themselves; and whose truth is a conformity, not to the nature of things, but to our own hypothesis. Such are all propositions in pure Mathematics, and many in Ethics, *viz.* those which involve no assertion as to real matters of fact. It has been rightly remarked, that Mathematical propositions are not properly true or false in the same sense as any proposition respecting real fact is so called; and hence the truth (such as it is) of such propositions is necessary and eternal; since it amounts only to this, that any complex notion which you have arbitrarily framed, must be exactly conformable to itself. The proposition that "the belief in a future state, combined with a complete devotion to the present life, is not consistent with the character of prudence," would be not at all the less true if a future state were a chimera, and prudence a quality which was nowhere met with; nor would the truth of the Mathematician's conclusion be shaken, that "circles are to each other as the squares of their diameters," should it be found that there never had been a circle or a square, conformable to the definition, in *rerum naturâ*.

The Ethical proposition just instanced, is one of those which Locke calls "trifling," because the Predicate is merely a part of the complex idea implied by the subject; and he is right, if by "trifling" he means that it gives not, strictly speaking, any *information;* but he

should consider that to *remind* a man of what he had not, and what he would have thought of, may be, practically, as valuable as giving him information; and that most propositions in the best sermons, and all in pure Mathematics, are of the description which he censures.

It is indeed rather remarkable that he should speak so often of building Morals into a demonstrative Science, and yet speak so slightingly of those very propositions to which we must absolutely *confine* ourselves, in order to give to Ethics even the appearance of such a Science; for the instant you come to an assertion respecting a *matter of fact*, as that "men (*i.e. actually* existing men) are bound to practise virtue," or "are liable to many temptations," you have stepped off the ground of strict demonstration, just as when you proceed to practical Geometry.

But to return: it is of the utmost importance to distinguish these two kinds of Discovery of Truth; to the former, as we have said, the word "*information*" is most strictly applied; the communication of the latter is more properly called "*instruction.*" We speak of the *usual* practice; for it would be going too far to pretend that writers are uniform and consistent in the use of these, or of any other term. We say that the Historian gives us *information* respecting past times; the Traveller, respecting foreign countries: on the other hand, the Mathematician gives *instruction* in the principles of his Science; the Moralist *instructs* us in our duties; and we generally use the expressions "a well-informed man," and "a well-instructed man," in a sense conformable to that which has been here laid down. However, let the words be used as they may, the things are evidently different, and ought to be distinguished. It is a question comparatively unimportant, whether the term "Discovery" shall or shall not be extended to the eliciting of those Truths, which, being implied in our previous knowledge, may be established by mere strict Reasoning. Similar verbal questions indeed might be raised respecting many other cases: *e.g.* one has forgotten (*i.e.* cannot *recollect*) the name of some person or place; perhaps we even try to think of it, but in vain; at last some one reminds us, and we instantly *recognise* it as the one we wanted to recollect; it may be asked, was this in our mind or not? The answer is, that in one sense it was, and in another sense, it was not. Or, again, suppose there is a vein of metal on a man's estate which he does not know of; is it part of his possessions or not? and when he finds it out and works it, does he then *acquire* a *new* possession or not? Certainly not, in the same sense as if he has a fresh estate bequeathed to him, which he had formerly no *right* to; but to all practical purposes, it *is* a new possession. This case indeed may serve as an illustration of the one we have been considering; and in all these cases, if the real distinction be understood, the verbal question will not be of much consequence. To use one more illustration; Reasoning has been aptly compared to the piling together blocks

of stone; on each of which, as on a pedestal, a man can raise himself a small, and but a small, height above the plain; but which, when skilfully built up, will form a flight of steps, which will raise him to a great elevation. Now (to pursue this analogy) when the materials are all ready to the builder's hand, the blocks ready dug and brought, his work resembles one of the two kinds of Discovery just mentioned, *viz.* that to which we have assigned the name of *instruction:* but if his materials are to be entirely, or in part, provided by himself,—if he himself is forced to dig fresh blocks from the quarry,—this corresponds to the other kind of Discovery.

We have hitherto spoken of the employment of argument in the establishment of those hypothetical Truths (as they may be called) which relate only to our own abstract notions; it is not, however, meant to be insinuated that there is no room for Reasoning in the establishment of a matter of fact; but the other class of Truths have first been treated of, because in discussing subjects of that kind the process of Reasoning is always the *principal*, and often the *only* thing to be attended to, if we are but certain and clear as to the meaning of the terms; whereas, when assertions respecting real existence are introduced, we have the additional and more important business of ascertaining and keeping in mind the *degree* of *evidence* for those facts, since, otherwise, our Conclusions could not be relied on, however accurate our Reasoning; but, undoubtedly, we may by Reasoning arrive at matters of fact, *if* we have *matters* of *fact to set out with as data;* only that it will very often happen that "from certain facts," as Campbell remarks, "we draw only probable Conclusions;" because the other Premiss introduced (which he overlooked) is only probable. He observed that in such an instance, for example, as the one lately given, we infer from the *certainty* that such and such tyrannies have been short-lived, the *probability* that others will be so; and he did not consider that there is an understood Premiss which is essential to the argument; (*viz.* that all tyrannies will resemble those we have already observed,) which being only of a probable character, must attach the same degree of uncertainty to the Conclusion. An *individual* fact is not unfrequently elicited by skilfully combining, and Reasoning from, those already known; of which many curious cases occur in the detection of criminals by officers of justice, and Barristers, who acquire by practice such dexterity in that particular department, as sometimes to draw the right Conclusion from data, which might be in the possession of others, without being applied to the same use. In all cases of the establishment of a *general* fact from Induction, that *general* fact (as has been formerly remarked) is *ultimately* established by Reasoning; *e.g.* Bakewell, the celebrated cattle-breeder, observed, in a great number of individual beasts, a tendency to fatten readily, and in a great number of others the absence of this constitution; in every

individual of the former description, he *observed* a certain peculiar *make*, though they differed widely in size, colour, &c. Those of the latter description differed no less in various points, but agreed in being of a different make from the others: these facts were his data; from which, combining them with the general principle that Nature is steady and uniform in her proceedings, he *Logically* drew the conclusion that beasts of the specified make have universally a peculiar tendency to fattening: but then his principal merit consisted in *making* the observations, and in so *combining* them as to *abstract* from each of a multitude of cases, differing widely in many respects, the circumstances in which they all agreed; and also in conjecturing skilfully how far those circumstances were likely to be found in the whole class; the making such observations, and still more the combination, abstraction, and judgment employed, are what men commonly mean (as was above observed) when they speak of *Induction;* and these operations are certainly distinct from Reasoning. The same observations will apply to numberless other cases, as, for instance, to the Discovery of the law of "*vis inertiæ*," and the other principles of Natural Philosophy.

But to what class, it may be asked, should be referred the Discoveries thus made? All would agree in calling them, when first ascertained, "New Truths," in the strictest sense of the word; which would seem to imply their belonging to the class which may be called, by way of distinction, "*Physical Discoveries:*" and yet their being ultimately established by Reasoning, would seem, according to the foregoing rule, to refer them to the other class, *viz.* what may be called "*Logical* Discoveries;" since whatever is established by Reasoning, must have been contained and virtually asserted in the Premises. In answer to this, it is to be observed, that they certainly do belong to the latter class, *relatively*, to a person who is *in possession of the data;* but to him who is *not*, they are New Truths of the other class; for it is to be remembered, that the words "Discovery" and "New Truths" are necessarily *relative:* there may be a proposition which is to one person absolutely *known;* to another, (*viz.* one to whom it has never *occurred*, though he is in possession of all the data from which it may be *proved*) it will be, when he comes to perceive it, by a process of *instruction*, what we have called a *Logical Discovery;* to a third, (*viz.* one who is ignorant of these data,) it will be absolutely *unknown*, and will have been, when made known to him, a perfectly and properly New Truth,—a piece of information,—a *Physical Discovery* as we have called it. To the Philosopher, therefore, who arrives at the Discovery by Reasoning from his observations, and from established principles combined with them, the Discovery is of the former class; to the multitude, probably of the latter, as *they* will have been most likely not possessed of all his data. It follows from what has been said, that in Mathematics, and in such Ethical pro-

positions as we were lately speaking of, we do not allow the possibility of *any* but a Logical Discovery; *i.e.* no proposition, of that class, can be true, which was not implied in the definitions we set out with, which are the first principles: for since these propositions do not profess to state any matter of fact, the only Truth they *can* possess, *consists* in conformity to the original principles; to one, therefore, who *knows* these principles, such propositions are Truths already implied, since they may be developed to him by Reasoning, if he is not defective in the discursive faculty; to one who does *not* understand those principles, (*i.e.* is not master of the definitions) such propositions are absolutely unmeaning. On the other hand, propositions relating to matters of fact, *may be*, indeed, implied in what he already knew; (as he who knows the climate of the Alps, the Andes, &c. &c. has virtually admitted the general fact, that "the tops of mountains are comparatively cold;") but as these possess an absolute and physical Truth, they *may* also be absolutely "new," their Truth not being *implied by the mere terms of the propositions.* The truth or falsity of any proposition concerning a triangle, is implied by the meaning of that and of the other Geometrical terms; whereas, though one may *understand* (in the ordinary sense of that word) the full meaning of the terms, "moon" and "inhabited," and of all the other terms in the language, he cannot thence be certain that the moon is, or is not, inhabited.

It has probably been the source of much perplexity that the term "*true*" has been applied *indiscriminately* to two such different classes of propositions. The term *definition* is used with the same laxity; and much confusion has thence resulted.

Such Definitions as the Mathematical, must imply every attribute that belongs to the thing defined; because that *thing* is merely *our meaning*, which meaning the Definition lays down; whereas, real substances, having an independent existence, may possess innumerable qualities (as Locke observes) not implied by the meaning we attach to their names, or, as Locke expresses it, by our ideas of them. "Their *nominal essence* (to use his language) is not the same as their *real essence:*" whereas the nominal essence, and the real essence, of a circle, &c. are the same. A Mathematical Definition, therefore, cannot properly be called *true*, since it is not properly a *proposition*, (any more than an article in a Dictionary,) but merely an explanation of the meaning of a term. Perhaps in Definitions of this class, it might be better to substitute (as Aristotle usually does) the *imperative* mood for the indicative; thus bringing them into the form of postulates; for the Definitions and the postulates in Mathematics differ in little or nothing but the form of expression; *e.g.* "let a four-sided figure, of equal sides and right angles, be called a square," would clearly imply that such a figure is conceivable, and that the writer intended to employ that term to signify such a figure; which is

precisely all that is intended to be asserted. If, indeed, a Mathematical writer means to assert that the *ordinary* meaning of the term is that which he has given, *that*, certainly, *is* a proposition, which must be either true or false; but in defining a *new* term, the term indeed may be ill-chosen and improper, or the Definition may be self-contradictory, and consequently unintelligible; but the words, "true," and "false," do not apply. The same may be said of what are called *nominal* Definitions of other things, *i.e.* those which merely explain the meaning of the word; *viz.* they can be true or false only when they profess (and so far as they profess) to give the ordinary and established meaning of the term. But those which are called *real* Definitions, *viz.* which unfold the nature of the thing, (which they may do in *various degrees*,) to these the epithet "true" may be applied; and to make out such a Definition will often be the very *end* (not as in Mathematics the *beginning*) of our study.

In Mathematics there is no such distinction between nominal and real Definition; *the meaning of the term*, and the *nature of the thing*, being one and the same: so that *no correct Definition whatever* of any Mathematical term can be devised, which shall not imply every thing which belongs to the term.

When it is asked, then, whether such great Discoveries, as have been made in Natural Philosophy, were accomplished, or can be accomplished by *Reasoning?* the inquirer should be reminded, that the question is ambiguous; it may be answered in the affirmative, if by "Reasoning" is meant to be included the assumption of Premises; to the right performance of *that* work, is requisite, not only in many cases, the ascertainment of facts, and of the degree of evidence for doubtful propositions, (in which observation and experiment will often be indispensable,) but also a skilful *selection* and *combination* of known facts and principles; such as implies, amongst other things, the exercise of that powerful *abstraction* which seizes the common circumstances—the point of agreement—in a number of, otherwise dissimilar, individuals: it is in this that the greatest genius is shown. But if "Reasoning" be understood in the limited sense in which it is usually defined, then we must answer in the negative; and reply that such Discoveries are made by means of Reasoning *combined* with other operations.

In the process we have been speaking of, there *is* much Reasoning throughout; and thence the whole has been carelessly called a "Process of Reasoning."

It is not, indeed, any just ground of complaint that the word Reasoning is used in two senses; but that the two senses are perpetually confounded together: and hence it is that some Logical writers fancied that Reasoning (*viz.* that which Logic treats of) was the method of discovering Truth; and that so many other writers have accordingly complained of Logic for not accomplishing that end,

urging that "Syllogism" (*i.e.* Reasoning, though they overlooked the coincidence) never established any thing that is, strictly speaking, unknown to him who has granted the Premises: and proposing the introduction of a certain "rational Logic" to accomplish this purpose; *i.e.* to direct the mind in the progress of investigation. Supposing that some such system could be devised—that it could even be brought into a Scientific form, (which he must be more sanguine than Scientific who expects,) that it were of the greatest conceivable utility, and that it should be allowed to bear the name of "Logic," since it would not be worth while to contend about a word, still it would not as these writers seem to suppose, have the same object proposed with the Aristotelian Logic; nor be in any respect a rival to that system. A *plough* may be a much more ingenious and valuable instrument than a *flail*, but it never can be substituted for it.

Those Discoveries of general laws of Nature, &c., of which we have been speaking, being of that character which we have described by the name of "Logical Discoveries," *to him who is in possession of all the Premises from which they are deduced;* but being, *to the multitude* (who are unacquainted with many of those Premises) strictly "New Truths;" hence it is, that men in general give to the *general* facts, and to them, most peculiarly, the name of *Discoveries;* for to *themselves* they *are* such, in the strictest sense; the Premises from which they were inferred being not only originally unknown to them, but frequently *remaining unknown to the very last: e.g.* the general conclusion concerning cattle, which Bakewell made known, is what most Agriculturists (and many others also) are acquainted with; but the Premises he set out with, *viz.* the facts respecting this, that, and the other, individual ox, (the ascertainment of which facts was his first *Discovery*) these are what few know, or care to know, with any exact particularity.

And it may be added, that these discoveries of particular facts, which are the *immediate* result of *observation*, are, in themselves, uninteresting and insignificant, *till* they are combined so as to lead to a grand general result; those who on each occasion watched the motions, and registered the date of a comet, little thought, perhaps, themselves, what magnificent results they were preparing the way for. So that there is an additional cause which has confined the term Discovery to these grand general conclusions; and, as was just observed, they are, to the generality of men, perfectly New Truths in the strictest sense of the word, not being implied in any previous knowledge *they* possessed. Very often it will happen, indeed, that the conclusion thus drawn will amount only to a *probable conjecture;* which conjecture will dictate to the inquirer such an *experiment*, or course of experiments, as will fully establish the fact; thus Sir H. Davy, from finding that the flame of hydrogen gas was not communicated through a long slender tube, conjectured that a shorter, but still

slenderer tube, would answer the same purpose; this led him to try the experiments, in which, by continually shortening the tube, and at the same time lessening its bore, he arrived at last at the wire-gauze of his safety-lamp.

It is to be observed also, that whatever *credit* is conveyed by the word "Discovery," to him who is regarded as the author of it, is well deserved by those who skilfully select and combine known Truths, (*especially* such as have been *long* and *generally known*,) so as to elicit important, and hitherto unthought-of, conclusions; theirs is the master mind; αρχιτεκτονικὴ Φρόνησις· whereas men of very inferior powers may sometimes, by immediate observation, discover perfectly new facts, empirically, and thus be of service in furnishing materials to the others; to whom they stand in the same relation (to recur to a former illustration) as the brickmaker or stonequarrier, to the architect. It is peculiarly creditable to Adam Smith, and to Malthus, that the data from which they drew such important Conclusions had been in every one's hands for centuries.

As for Mathematical Discoveries, they (as we have before said) must *always* be of the description to which we have given the name of "Logical Discoveries;" since to him who properly comprehends the meaning of the Mathematical terms, (and to no other are the Truths themselves, properly speaking, intelligible,) those results are implied in his previous knowledge, since they are Logically deducible therefrom. It is not, however, meant to be implied, that *Mathematical* Discoveries are effected by pure Reasoning, and by that *singly*. For though there is not here, as in Physics, any exercise of judgment as to the degree of evidence of the Premises, nor any experiments and observations, yet there is the same call for skill in the *selection* and *combination* of the Premises in such a manner as shall be best calculated to lead to a new, that is, *unperceived* and *unthought-of* Conclusion.

In *following*, indeed, and *taking in* a demonstration, nothing is called for but pure Reasoning; but *the assumption of Premises is not a part* of Reasoning, in the strict and technical sense of that term. Accordingly, there are many who can *follow* a demonstration, or any other train of argument, who would not succeed well in *framing* one of their own.[4]

For both kinds of Discovery then, the Logical, as well as the Physical, certain operations are requisite, beyond those which can fairly be comprehended under the strict sense of the word "Reasoning;" in the Logical, is required a skilful *selection* and *combination of known Truths;* in the Physical we must employ, in *addition* (generally speaking) to that process, *observation* and *experiment*. It will generally happen, that in the study of Nature, and, universally,

[4] Hence the Student must not confine himself to this passive kind of employment, if he would become truly a Mathematician.

in all that relates to matters of fact, *both* kinds of investigation will be united; *i.e.* some of the facts or principles you *reason from* as Premises, must be ascertained by *observation;* or, as in the case of the safety-lamp, the ultimate *Conclusion* will need *confirmation* from experience; so that both Physical and Logical Discovery will take place in the course of the same process: we need not, therefore, wonder, that the two are so perpetually confounded. In Mathematics, on the other hand, and in great part of the discussions relating to Ethics and Jurisprudence, there being no room for any Physical Discovery whatever, we have only to make *a skilful* use of the propositions in our possession, to arrive at every attainable result.

The investigation, however, of the latter class of subjects differs in *other* points also from that of the former; for setting aside the circumstance of our having, in these, no question as to facts,—no room for observation,—there is also a considerable difference in what may be called the process of *Logical investigation;* the *Premises* on which we proceed being of so different a nature in the two cases.

To take the example of Mathematics, the definitions, which are the principles of our Reasoning, are very *few*, and the axioms still fewer; and both are, for the most part, *laid down*, and *placed before the student in the outset;* the introduction of a new definition or axiom, being of comparatively rare occurrence, at wide intervals, and with a *formal* statement; besides which, there is no room for *doubt* concerning either. On the other hand, in all Reasonings which regard matters of fact, we introduce, almost at *every step*, fresh and fresh propositions (to a very great number) which had not been elicited in the course of our Reasoning, but are taken for granted; *viz.* facts and laws of Nature which are here the principles of our Reasoning, and *maxims*, or "elements of belief," which answer to the axioms in Mathematics. If, at the opening of a Treatise, for example, on Chemistry, on Agriculture, on Political Economy, &c., the author should make, as in Mathematics, a formal statement of all the propositions he intended to assume, as granted throughout the whole work, both he and his readers would be astonished at the number: and, of these, many would be only probable, and there would be much room for doubt as to the *degree* of probability, and for judgment, in ascertaining that degree.

Moreover, Mathematical axioms are always employed precisely *in the same simple form; e.g.* the axiom that "things equal to the same, are equal to one another," is cited, whenever there is need, in those very words; whereas the maxims employed in the other class of subjects, admit of, and require, continual modifications in the application of them: *e.g.* "the stability of the laws of Nature," which is our constant assumption in inquiries relating to Natural Philosophy, assumes many different shapes, and in some of them, does not possess the same absolute certainty as in others: *e.g.* when from having

always observed a certain sheep ruminating, we infer, that this individual sheep will continue to ruminate, we assume that "the property which has hitherto belonged to this sheep, will remain unchanged;" when we infer the same property of all sheep, we assume that "the property which belongs to this individual, belongs to the whole species:" if, on comparing sheep with some other kinds of horned animals, and finding that all agree in ruminating, we infer that, "all horned animals ruminate," we assume that "the whole of a genus or class are likely to agree in any point wherein many species of that genus agree;" or in other words, "that if one of two properties, &c., has *often* been found accompanied by another, and never without it, the former will be *universally* accompanied by the latter;" now all these are merely different forms of the maxim, that "nature is uniform in her operations;" which, it is evident, varies in expression in almost every different case where it is applied, and admits of every degree of evidence, from absolute moral certainty, to mere conjecture.

The same may be said of an infinite number of principles and maxims appropriated to, and employed in each particular branch of study. Hence, all such Reasonings are, in comparison of Mathematics, very complex; requiring so much *more* than that does, beyond the process of merely deducing the Conclusion Logically, from the Premises; so that it is no wonder that the longest Mathematical demonstration should be so much more easily constructed and understood, than a much shorter train of just Reasoning concerning real facts. The former has been aptly compared to a long and steep, but even and regular, flight of steps, which tries the breath, and the strength, and the perseverance, only; while the latter resembles a short, but rugged and uneven, ascent up a precipice, which requires a quick eye, agile limbs, and a firm step; and in which we have to tread now on this side, now on that; ever considering, as we proceed, whether this projection will afford room for our foot, or whether some loose stone many not slide from under us.

As for those Ethical and Legal Reasonings which were lately mentioned, as in some respects resembling those of Mathematics, (*viz.* such as keep clear of all assertions respecting facts,) they have this difference; that not only men are not so completely *agreed* respecting the maxims and principles of Ethics and Law, but the meaning also of each term cannot be absolutely, and for ever, fixed by an arbitrary definition; on the contrary, a great part of our labour consists in distinguishing accurately the various senses in which men employ each term, ascertaining which is the most proper, and taking care to avoid confounding them together.

Of Inference and Proof.

§ 3. Since it appears, from what has been said, that universally a man must possess something else besides the Reasoning faculty, in

order *to apply* that faculty properly to his own purpose, whatever that purpose may be; it may be inquired whether some theory could not be made out, respecting those "*other operations*," and "intellectual processes distinct from Reasoning, which it is necessary for us sometimes to employ in the investigation of truth;"[5] and whether rules could not be laid down for conducting them.

Something has, indeed, been done in this way by more than one writer; and more might probably be accomplished by one who should fully comprehend, and carefully bear in mind the principles of Logic, properly so called; but it would hardly be possible to build up any thing like a regular *Science*, respecting these matters, such as Logic is, with respect to the theory of Reasoning. It may be useful, however, to observe, that these "*other operations*" of which we have been speaking, and which are preparatory to the exercise of Reasoning, are of *two kinds*, according to the nature of the end proposed; for Reasoning comprehends *Inferring* and *Proving*; which are not two different things, but the same thing regarded in *two different points of view*: (like the road from London to York, and the road from York to London,) he who infers,[6] proves; and he who proves, infers; but the word "infer" fixes the mind *first* on the Premiss, and then on the *Conclusion*; the word "prove," on the contrary, leads the mind *from* the Conclusion *to* the Premiss. Hence, the substantives derived from these words respectively, are often used to express that which, on each occasion, is *last* in the mind; *Inference* being often used to signify the *Conclusion*, (*i.e. Proposition inferred*) and *Proof*, the *Premiss*. We say also "How do you *prove* that?" and "What do you *infer from* that?" which sentences would not be so properly expressed if we were to transpose those verbs. One might, therefore, define *Proving*, "the assigning of a reason or argument for the support of a *given* proposition;" and "*Inferring*," the "deduction of a Conclusion from *given* Premises." In the one case our *Conclusion* is *given*, (*i.e.* set before us) and we have to *seek* for *arguments*; in the other, our Premises are *given*, and we have to *seek* for a Conclusion; *i.e.* to put together our own propositions, and try *what* will follow from them; or, to speak more Logically, in the one case, we seek to refer the subject of which we would predicate something, to a class to which that predicate will (affirmatively or negatively) apply; in the other we seek to find comprehended, in the subject of which we have predicated something, some other term to which that predicate had not been before applied. Each of these is a definition of Reasoning.

To *infer*, then, is the business of the *Philosopher*; to *prove*, of the *Advocate*; the former, from the great mass of known and admitted truths, wishes to elicit *any* valuable additional truth whatever, that has been hitherto unperceived; and, perhaps, without knowing with

[5] D. Stewart.

[6] We mean, of course, when the word is understood to imply *correct* Inference.

certainty, what will be the terms of his Conclusion. Thus the Mathematician, *e.g.* seeks to ascertain *what* is the ratio of circles to each other, or *what* is the line whose square will be equal to a given circle: the Advocate, on the other hand, has a proposition put before him, which he is to maintain as well as he can; his business, therefore, is to *find middle terms*, (which is the *inventio* of Cicero;) the Philosopher's, to combine and select known facts, or principles, suitably for gaining from them conclusions which, though implied in the Premises, were before unperceived; in other words, for making "Logical Discoveries." Such are the respective preparatory processes in these two branches of study. They are widely different;—they arise from, and generate, very different habits of mind; and require a very different kind of training and precept. The Lawyer, or Controversialist, or, in short, the Rhetorician in general, who is, in his own province, the most skilful, may be but ill-fitted for Philosophical investigation, even where there is no *observation* wanted,—when the facts are all *ready ascertained* for him. And again, the ablest Philosopher may make an indifferent disputant; especially, since the arguments which have led *him* to the Conclusion, and have, with him, the most weight, may not, perhaps, be the most powerful in controversy. The commonest fault, however, by far, is to forget the Philosopher or Theologian, and to assume the Advocate, improperly. It is therefore of great use to dwell on the distinction between these two branches: as for the bare process of Reasoning, *that* is the same in both cases; but the preparatory processes which are requisite *in order to employ* Reasoning profitably, these we see branch off into two distinct channels. In each of these undoubtedly, useful rules may be laid down; but they should not be confounded together. Bacon has chosen the department of Philosophy, giving rules in his *Organon*, (not only for the conduct of experiments to ascertain new facts, but also for the selection and combination of known facts and principles,) with a view of obtaining valuable *Inferences*; and it is probable that a system of such rules is what some writers mean (if they have any distinct meaning) by their proposed "Logic." In the other department, precepts have been given by Aristotle and other Rhetorical writers, as a part of their plan. How far these precepts are to be considered as belonging to the present system,—whether "method" is to be regarded as a *part* of *Logic*,—whether the matter of Logic is to be included in the system,—whether Bacon's is properly to be reckoned a kind of Logic; all these are merely verbal questions relating to the extension, not of the *Science*, but of the *name*. The bare process of Reasoning, *i.e.* deducing a Conclusion from Premises, must ever remain a distinct operation from the *assumption* of Premises, however useful the rules may be that have been given, or may be given, for conducting this latter process, and others connected with it; and however properly such rules may be subjoined to the precepts

of that system to which the name of Logic is applied in the narrowest sense. Such rules as we now allude to may be of eminent service; but they must always be, as we have before observed, comparatively vague and general, and incapable of being built up into a regular demonstrative theory like that of the Syllogism; to which theory they bear much the same relation as the principles and rules of Poetical and Rhetorical criticism, to those of Grammar; or those of practical Mechanics, to strict Geometry. We find no fault with the extension of a term; but we would suggest a caution against confounding together, by means of a common name, things essentially different: and above all, we deprecate the sophistry of striving to depreciate what is called "the School Logic," by perpetually *contrasting* it with systems with which it has nothing in common but the *name;* and whose object is essentially different.

It is not a little remarkable that writers whose expressions tend to confound together, by means of a common name, two branches of study which have nothing else in common, (as if they were two different plans for attaining *one and the same* object,) have themselves complained of one of the effects of this confusion, *viz.* the introduction, early in the career of Academical Education, of a course of *Logic;* under which name, they observe, "men now universally comprehend the works of Locke, Bacon, &c." which, as is justly remarked, are unfit for beginners. Now this would not have happened, if men had always kept in mind the meaning or meanings of each name they used. And it may be added, that, however justly the word Logic may be thus extended, we have no ground for applying to the Aristotelian Logic the remarks above quoted respecting the Baconian; which the ambiguity of the word, if not carefully kept in view, might lead us to do. Grant that Bacon's work is a part of Logic; it no more follows from the unfitness of *that* for *learners*, that the elements of the theory of Reasoning should be withheld from them, than it follows that the elements of Euclid, and common Arithmetic, are unfit for boys, because *Newton's Principia*, which also bears the title of *Mathematical*, is above their grasp. Of two branches of study which bear the same name, or even of two parts of the same branch, the one may be suitable to the commencement, the other to the close, of the Academical career.

At whatever period of that career it may be proper to introduce the study of such as are usually called Metaphysical writers, it may be safely asserted, that those who have had the most experience in the business of giving instruction in Logic, properly so called, together with other branches of knowledge, prefer and generally pursue the plan of letting their pupils *enter* on that study next in order, after the elements of Mathematics.

Of Verbal and Real Questions.

§ 4. The ingenious author of the *Philosophy of Rhetoric* having maintained, or rather assumed, that Logic is applicable to Verbal controversy alone, there may be an advantage, though it has been our aim throughout to show the application of it to all Reasoning, in pointing out the difference between Verbal and Real Questions, and the probable origin of Campbell's mistake; for to trace any error to its source, will often throw more light on the subject in hand than can be obtained if we rest satisfied with merely detecting and refuting it.

Every Question that can arise, is in fact a Question whether a certain Predicate is or is not applicable to a certain subject; and whatever other account may be given by any writer of the nature of any matter of doubt or debate, will be found, ultimately, to resolve itself into this. But sometimes the Question turns on the meaning and extent of the terms employed; sometimes on the things signified by them. If it be made to appear therefore, that the opposite sides of a certain Question may be held by persons not differing in their opinion of the matter in hand, then that Question may be pronounced Verbal, as depending on the different senses in which they respectively employ the terms. If on the contrary it appears that they employ the terms in the same sense, but still differ as to the application of one of them to the other, then it may be pronounced that the Question is Real,—that they differ as to the opinions they hold of the things in Question.

If, for instance, two persons contend whether Augustus deserved to be called a great man, then if it appeared that the one included under the term "great," disinterested *patriotism*, and *on that ground* excluded Augustus from the class, as wanting in that quality, and that the other also gave him no credit for that quality, but understood no more by the term "great," than high intellectual qualities, energy of character, and brilliant actions, it would follow that the parties did not differ in opinion except as to the use of a term, and that the Question was Verbal. If again it appeared that the one *did* give Augustus credit for such patriotism as the other denied him, both of them including that idea in the term great, then the Question would be Real. Either kind of Question, it is plain, is to be argued according to Logical principles; but the middle terms employed would be different; and for this reason among others it is important to distinguish Verbal from Real controversy. In the former case, *e.g.* it might be urged with truth, that the common use of the expression "great and good" proves that the idea of good is not implied in the ordinary sense of the word great; an argument which could have, of course, no place in deciding the other Question.

It is by no means to be supposed that all Verbal Questions are

trifling and frivolous; it is often of the highest importance to settle correctly the meaning of a word, either according to ordinary use, or according to the meaning of any particular writer, or class of men; but when Verbal Questions are *mistaken* for Real, much confusion of thought and unprofitable wrangling will be generally the result. Nor is it always so easy and simple a task, as might at first sight appear, to distinguish them from each other: for several objects to which one common name is applied will often have many points of difference, and yet that name may perhaps be applied to them all in the same sense, and may be fairly regarded as the genus they come under, if it appear that they all agree in what is designated by that name, and that the differences between them are in points not essential to the character of the genus. A cow and a horse differ in many respects, but agree in all that is implied by the term "quadruped," which is therefore applicable to both in the same sense. So also the houses of the ancients differed in many respects from ours, and their ships still more; yet no one would contend that the terms "house" and "ship," as applied to both, were ambiguous, or that οἶκος might not fairly be rendered *house*, and ναῦς, *ship:* because the essential characteristic of a house is, not its being of this or that form or materials, but its being a dwelling for men; these therefore would be called *two different kinds* of houses; and consequently the term "house" would be applied to each, without any equivocation, in the same sense: and so in the other instances. On the other hand, two or more things may bear the same name, and may also have a resemblance in many points, and may from that resemblance have come to bear the same name, and yet if the circumstance which is essential to each be wanting in the other, the term may be pronounced ambiguous: *e.g.* the word "Priest" is applied to the ministers of the Jewish and of the Pagan religions, and also to those of the Christian: and doubtless the term is so used in consequence of their being both *ministers*, (in some sort) of religion. Nor would every difference that might be found between the Priests of different religions constitute the term ambiguous, provided such differences were non-essential to the idea suggested by the word Priest; as *e.g.* the Jewish Priest served the true God, and the Pagan, false Gods: this is a most important difference, but does not constitute the term ambiguous, because neither of these circumstances is implied and suggested by the term Ἱερεύς, which accordingly was applied both to Jewish and Pagan Priests. But the term Ἱερεύς does seem to have implied the office of offering *sacrifice*, atoning for the sins of the people, and acting as mediator between man and the object of his worship; and accordingly that term is never applied to any one under the Christian system, except to the one great Mediator. The Christian ministers not having that office which was implied as essential in the term Ἱερεύς, were never called by that name, but by that of πρεσβύτερος. It may be concluded, therefore, that the term

Priest is ambiguous, as corresponding to the terms Ἱερεὺς and πρεσβύτερος respectively, notwithstanding that there are points in which these two agree. These therefore should be reckoned, not *two different kinds* of Priests, but Priests in two different senses; since, (to adopt the phraseology of Aristotle,) the definition of them so far forth as they are Priests, would be different.

It is evidently of much importance to keep in mind the above distinctions, in order to avoid, on the one hand, stigmatizing as Verbal controversies, what in reality are not such, merely because the Question turns on the applicability of a certain Predicate to a certain subject; or on the other hand, falling into the opposite error of mistaking words for things, and judging of men's agreement or disagreement in opinion in every case, merely from their agreement or disagreement in the terms employed.

Of Realism.

§ 5. Nothing has a greater tendency to lead to the mistake just noticed, and thus to produce *undetected* Verbal Questions and fruitless Logomachy, than the prevalence of the notion of the Realists, that genus and species were some real Things, existing independently of our conceptions and expressions, and that, as in the case of singular terms, there is some real individual corresponding to each, so in common terms also there is something corresponding to each, which is the object of our thoughts when we employ any such term.[7] Few, if any, indeed, in the present day avow and maintain this doctrine; but those who are not especially on their guard, are perpetually sliding into it unawares. Nothing so much conduces to this as the transferred and secondary use of the words "same," "one and the same," "identical, &c." when it is not clearly perceived and carefully borne in mind that they *are* employed in a secondary sense, and *that* more frequently even than in the primary. Suppose *e.g.* a thousand persons are thinking of the sun, it is evident it is one and the same individual object on which all these minds are employed; so far all is clear: but suppose all these persons are thinking of a triangle; not any individual triangle, but triangle in general; and considering perhaps the equality of its angles to two right angles; it would seem as if in this case also, their minds were all employed on "one and the same" object: and this object of their thoughts, it may be said, cannot be the *mere word* triangle, but that which is meant by it; nor again, can it be every thing that the word will apply to, for they are not thinking of *triangles*, but of *one* thing: those who do not acknowledge that this "one thing" has an existence independent of the human mind, are in general content to tell us by way of explanation, that the object of their thoughts is the abstract "idea" of a triangle; an

[7] A doctrine commonly, but falsely, attributed to Aristotle, who expressly contradicts it. Categories, περὶ οὐσίας.

explanation which satisfies, or at least silences many, though it may be doubted whether they very clearly understand what sort of a thing an idea is, which may thus exist in a thousand different minds at once, and yet be "one and the same."

The fact is, that "unity" and "sameness" are in such cases employed, not in the primary sense, but to denote perfect *similarity*. When we say that ten thousand different persons have all "one and the same" idea in their minds, or are all of "one and the same" opinion, we mean no more than that they are all *thinking exactly alike;* when we say that they are all in the "same" posture, we mean that they are all *placed alike:* and so also they are said all to have the "same" disease when they are all diseased alike.

The origin of this secondary sense of the words, "same," "one," "identical," &c. (an attention to which would clear away an incalculable mass of confused Reasoning and Logomachy,) is easily to be traced to the use of language and of other signs, for the purpose of mutual communication. If any one utters the "one single" word "triangle," and gives "one single" definition of it, each person who hears him forms a certain notion in his own mind, not differing in any respect from that of each of the rest; they are said therefore to have all "one and the same" notion, because, resulting from, and corresponding with, that which is in the primary sense "one and the same" expression; and there is said to be "one single" idea of every triangle, (considered merely as a triangle,) because one single name or definition is equally applicable to each. In like manner all the coins struck by the same single die, are said to have "one and the same" impression, merely because the one description which suits one of these coins will equally suit any other that is exactly like it.

It is not intended to recommend the disuse of the words "same," "identical," &c. in this transferred sense; which, if it were desirable, would be utterly impracticable; but merely, a steady attention to the ambiguity thus introduced, and watchfulness against the errors thence arising. The difficulties and perplexities which have involved the questions respecting personal identity, among others, may be traced principally to the neglect of this caution. But the further consideration of that question would be unsuitable to the subject of this article.

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* The author of the Treatise on Logic is not accountable for the contents of this Index.—Editor Ency. Met.

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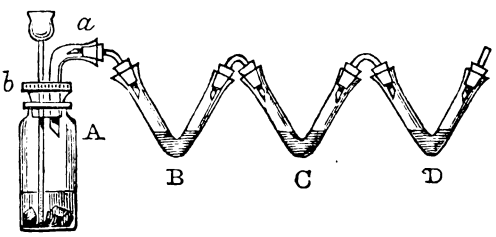

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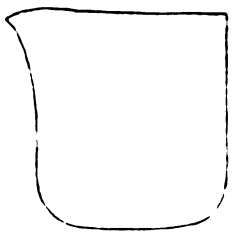

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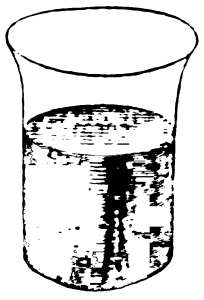

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	oz.	0	3
— Nitrate, cryst.	oz.	0	2
— Oxalate, neutral, cryst.	oz.	0	9
— Superoxalate, cryst.	oz.	0	6
— Red Prussiate, cryst.	oz.	1	4
— Sulphate, cryst.	oz.	0	2
— Bisulphate, cryst.	oz.	0	1
— — fused	oz.	0	1
Potassium, metallic	oz.	25	0
— Bromide, cryst.	oz.	4	0
— Cyanide, fused	oz.	1	0
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1751. The ENCYCLOPÆDIA METROPOLITANA, may be had COMPLETE, in 30 volumes, 4to, at the following prices:—

HALF-BOUND RUSSIA, 25 *guineas.* HALF-BOUND MOROCCO GILT, 28 *guineas.*

This Work is entirely original, written by the most eminent men of the age, upon a peculiar methodical plan, (fully explained in Part I.) It contains 23,000 quarto pages of letter press and 600 quarto pages of engravings.

1752. FOSSIL INFUSORIA FOR EXAMINATION BY THE MICROSCOPE: A Cabinet containing Twelve Specimens of Minerals,—Siliceous, Calcareous, Carboniferous, Ferruginous,—consisting principally of the Skeletons of Infusoria. Price, including 12 bottles, 7*s.* 6*d.*

Names of the Specimens in the Cabinet:—

1. Infusorial Earth; Infusorien Erde; Reine Kieselerde; Pure Silica; Kieselguhr; Gouhr Siliceux.—From Franzensbrunnen in Bohemia.
2. *The same.*—From Gossa in Bohemia.
3. *The same.*—From Obero in Luneberg.
4. Infusorial Earth; Infusorienerde.—From the Thiergarten in Berlin.
5. Polishing Slate; Polierschiefer; Infusorienschiefer; Schiste tripoléen.—From Bilin in Bohemia.
6. *The same.*—From Habichtswald, near Cassel, in Germany.
7. Semi-Opal; Halb-Opal; Quarz resinite xyloïde. Consisting of Brown Coal altered by Volcanic action.—From Bilin, near Töplitz, in Bhoemia.
8. Flint; Feuerstein; Pièrre de fusil.—From Fünen in Denmark.
9. Chalk; Kreide; Craie.—From Zealand.
10. *The same.*—From Kent, in England.
11. Paper Coal; Dysodil; Houille papyracée.—From Salzhausen in Hessia.
12. Bog Iron Ore; Raseneisenstein; Fer hydraté limoneux.—From Liebenwerda in Saxony.

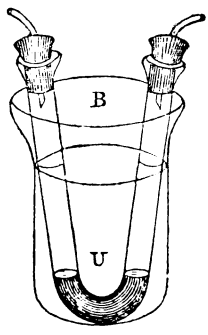
GAS CONDENSERS, OR SUBSTITUTE FOR WOULFF'S APPARATUS, in small experiments.

1753. U-shaped, *Fig.* 1753, small, 17 inches by $\frac{3}{4}$ inch, 1*s.* 6*d.*

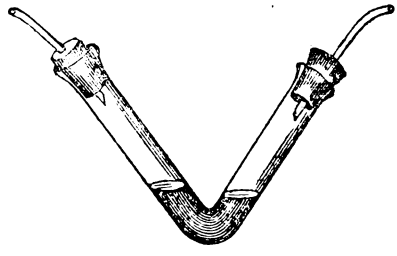
1754. U-shaped, *Fig.* 1753, large, 21 inches by 1 inch, 2*s.* 6*d.*

1755. V-shaped, small, 10 inches by $\frac{3}{4}$ inch, with legs of unequal length, 1*s.*

1756. V-shaped, *Fig.* 1756, large, 15 inches by $\frac{3}{4}$ inch, with equal legs, 1*s.* 3*d.*



1753.


1756.

Without Fittings, at the above Prices.

1757. A strong ∩-shaped Conducting Tube, with ground ends, for connecting the U-shaped Condenser to a gas bottle, 9*d.*

1758. A strong ∩-shaped Conducting Tube, with ground ends, for connecting the V-shaped Condenser to a gas bottle, 9*d.*

The use of the above Apparatus is illustrated in Chemical Recreations, p. 302. When the Condenser contains a small quantity of water, and is immersed in iced-water contained in a beaker, a saturated solution is easily procured of any gas that is absorbable by water, such as Ammonia.

This Apparatus also serves for washing or drying gases, or for trying their action on different solutions. See No. 1729.

GEOLOGY.—COLLECTIONS OF FOSSILS, arranged in the order in which they occur in the Strata composing the crusts of the earth, according to the system described in the *Lethaea Geognostica* of PROFESSOR BRONN. With an ample descriptive printed Catalogue in French, English, and German, containing numerous synonyms.

These Collections contain Fossils belonging to all formations, and from many localities, and in such variety as could only be obtained by the assiduous researches of many years, attended by very great expense. The utmost pains has been taken by a competent Naturalist (a German Professor) to determine and name the specimens with accuracy. The Catalogue shows the prevalent name of each Fossil, its most important synonyms, with their authorities, and its stratographical and geographical locality. The arrangement of the Catalogue agrees strictly with that of BRONN'S *Lethaea Geognostica*, the most useful book on Organic Remains that has yet been published.

Prices of the Collections, with printed Catalogues:—

1759. Three hundred Specimens, 15*l.*
1760. Five hundred Specimens, 25*l.*

The following Collections of Fossils have written Catalogues:—

1761. One hundred Specimens, 3*l.* 3*s.*
1762. One hundred and fifty Specimens, 5*l.* 5*s.*

GEOLOGICAL COLLECTIONS, containing Specimens of ROCKS, with their CHARACTERISTIC FOSSILS.

These Collections are adapted either for private study, or for the use of lecturers, and have been prepared with great attention to their scientific accuracy. The ROCKS are disposed in the order of their natural position relative to one another; and the FOSSILS, being those most characteristic of the different Rocks, and in number about one-third of the entire Collection, are placed just after the Rocks to which they belong. The Collections are accompanied with PRINTED CATALOGUES containing the synonymous names in French, German, and English, with short remarks on the localities and peculiarities of the different formations.

The size of the Cut Specimens of Rocks is 9 square inches, namely, 3½ inches by 2½ inches, very neatly cut, fresh, and clean.

1763. Collection of six hundred Specimens, 25*l.*
1764. Collection of five hundred Specimens, 20*l.*

GRADUATED GLASS INSTRUMENTS.—We beg to inform our Chemical friends, that having completed our machinery for the graduation of Glass Apparatus, we can now undertake to supply Glass Measures graduated with the utmost accuracy to any desired scale; namely, Alcalimeters, Acidimeters, Chlorimeters, Eudiometers, Gas Tubes, Liquid Measures, &c., graduated to English Imperial Measure, Cubic Inches, or French Measures, or any divisions or multiples of these measures, decimal or arbitrary.

1765. GAY-LUSSAC'S CENTESIMAL ALCOHOLOMETER, a Glass Spindle, form of *fig.* 1768, scale 0° to 100°, each Degree showing 1 per cent. of pure Alcohol in any mixture of Spirit and Water, at the temperature of 15° Centigrade, or 59° Fahrenheit, in a pasteboard case, 4*s.* 6*d.*

HYDROMETERS, in the form of GLASS SPINDLES, *Fig.* 1768, for determining the SPECIFIC GRAVITY of all SOLUTIONS from sp. gr. 0·700 to sp. gr. 2·000, water being considered = 1·000. The delicacy of this instrument increases with the number of Spindles contained in the set. The entire scale, from ·700 to 2·000, may be contained on one Spindle, or on 2, 3, 4, 5, or 7 Spindles.

1766. ONE SPINDLE, scale from 0·700° to 1·000° by degrees of ·005°, and from 1·000° to 1·900° by degrees of ·010°; namely, ·805°, ·810°, and 1010°, 1020°, &c. With a Solution Tube, *Fig.* 1766, and a pasteboard box, 8*s*.

A useful instrument for preliminary trials, for students, or for common use when approximate indications are sufficient. It shows the specific gravity of all liquids, from alcohol to oil of vitriol. Each degree above 1000° is equal in range to 2° of Twaddell; below 1000°, each degree in equal to 1° of Twaddell.

SETS of HYDROMETERS in POLISHED WOODEN BOXES, *Fig.* 1769.

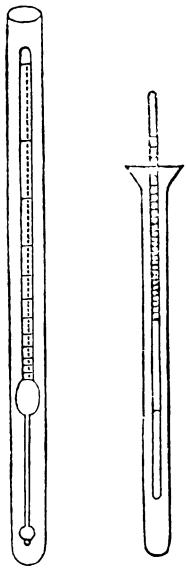
1767. Box containing Two SPINDLES, form of *Fig.* 1767, with Thermometer, and a Trial Jar for the Solutions, 1*l*. 4*s*.
Spindle *a*, scale ·700° to 1·200°, by ·010°.
Spindle *b*, scale 1·200° to 2·000°, by ·010°.

1768. Box containing THREE SPINDLES, form of *Fig.* 1768, with Thermometer and Trial Jar for Solutions, 1*l*. 16*s*.
Spindle *a*, scale ·700° to 1·000°, by ·002°.
Spindle *b*, scale 1·000° to 1·400°, by ·002°.
Spindle *c*, scale 1·400° to 1·970°, by ·002°.

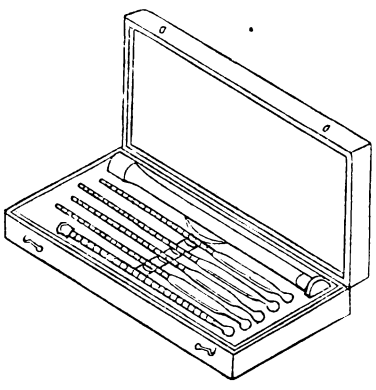
1769. Box containing FOUR SPINDLES, with Thermometer and Trial Jar for Solutions, *Fig.* 1769, 2*l*. 2*s*.
Spindle *a*, scale ·700° to 1·000°, by ·002°.
Spindle *b*, scale 1·000° to 1·300°, by ·001°.
Spindle *c*, scale 1·300° to 1·600°, by ·001°.
Spindle *d*, scale 1·600° to 1·950°, by ·001°.

1770. Box containing FIVE SPINDLES, with Thermometer and Trial Jar for Solutions, 2*l*. 12*s*. 6*d*.
Spindle *a*, scale ·700° to 1·000°, by ·001°.
Spindle *b*, scale 1·000° to 1·200°, by ·001°.
Spindle *c*, scale 1·200° to 1·400°, by ·001°.
Spindle *d*, scale 1·400° to 1·640°, by ·001°.
Spindle *e*, scale 1·640° to 1·900°, by ·001°.

1771. Box containing SEVEN SPINDLES, with Thermometer and Trial Jar for Solutions, 3*l*. 3*s*.
Spindle *a*, scale ·700° to ·850°, by ·001°.
Spindle *b*, scale ·850° to 1·000°, by ·001°.
Spindle *c*, scale 1·000° to 1·200°, by ·001°.
Spindle *d*, scale 1·200° to 1·400°, by ·001°.
Spindle *e*, scale 1·400° to 1·600°, by ·001°.
Spindle *f*, scale 1·600° to 1·800°, by ·001°.
Spindle *g*, scale 1·800° to 2·000°, by ·001°.



1766. 1767. 1768.



1769.

In all the above Spindles, where the scale rises by steps of ·001°, each *marked* DEGREE is equal to *one-fifth of a* DEGREE of TWADDELL'S Hydrometer. *See the Note to No.* 1795.

SEPARATE SPINDLES, each in a pasteboard box, at the prices quoted:—

1772. Scale ·700° to 1·000°, by 005°, 6*s.*
1773. Scale, 1·000° to 2·000°, by 010°, 6*s.* 6*d.*

Both Spindles in the form of *Fig.* 1767. Each has a trial tube. Owing to the narrowness of these Spindles, *very small quantities* of solution can be tried. In order that the Spindle may act freely in the narrow trial tube, the funnel at the top must be nearly filled with the solution.

1774. Scale, ·700° to 1·000°, by ·002°, *Fig.* 1768, 6*s.* 6*d.*
1775. Scale, 1·000° to 2·000°, by ·010°, *Fig.* 1768, 7*s.*
1776. Scale, ·700° to 1·000°, by ·001°, *Fig.* 1768, 9*s.*
1777. Scale, 1·000° to 1·350°, by ·005°, *Fig.* 1768, 6*s.*
1778. Scale, 1·350° to 1·900°, by ·005°, *Fig.* 1768, 6*s.*
1779. Scale, 1·000° to 1·300°, by ·002°, *Fig.* 1768, 6*s.* 6*d.*
1780. Scale, 1·300° to 1·600°, by ·002°, *Fig.* 1768, 6*s.* 6*d.*
1781. Scale, 1·600° to 1·900°, by ·002°, *Fig.* 1768, 6*s.* 6*d.*
1782. Scale, 1·000° to 1·020°, by ·0005°, *Fig.* 1768, 9*s.*

No. 1782 is for determining the density of *Sours*, &c. Very delicate.

HYDROMETER SPINDLES, which have a FAHRENHEIT'S THERMOMETER contained inside the Cylinder, *Fig.* 1847. Each in a pasteboard box, at the prices quoted :—

1783. Scale, ·700° to 1·000°, by ·002°, 10*s.* 6*d.*
1784. Scale, 1·000° to 1·350°, by ·002°, 10*s.* 6*d.*
1785. Scale, 1·350° to 1·900°, by ·002°, 10*s.* 6*d.*

The HYDROMETER SPINDLES, with a scale from 1·000° to 1·350°, by ·002°, may be had in the following forms :—

1786. The Spindle alone, *Fig.* 1768, in a pasteboard box, 6*s.*
1787. The Spindle, with a Trial Jar for Solutions, in a polished wooden box, 1*l.*
1788. The Spindle, with a Thermometer within it, *Fig.* 1847, in a pasteboard box, 10*s.* 6*d.*
1789. The Spindle, with Thermometer within it, and a Trial Jar for Solutions, in a polished wooden box, 1*l.* 4*s.*

All other forms of Hydrometer,—Nicholson's, Beaumé's, Fahrenheit's, &c.; also Alcoholometers, Urinometers, Volumeters, &c.

1790. HYDROMETERS (TWADDELL'S), WARRANTED ACCURATE, GRIFFIN'S IMPROVED FORM, in which the round bulb is replaced by a pear-shaped body, or a cylinder. The advantages of these forms over the bulb are, GREATER DURABILITY, and the power of taking the density of a *smaller quantity of liquid.*

Price of Single Spindles, each in a Pasteboard Box.	Cylindrical Form.		Pear-shaped Form.	
	s.	*d.*	*s.*	*d.*
No. 1— 0° to 24°	2	6	3	0
2— 24° to 48°	2	6	3	0
3— 48° to 74°	3	0	3	6
4— 74° to 102°	3	0	3	6
5—102° to 138°	3	6	4	0
6—138° to 170°	3	6	4	0

1791. Set of six Cylindrical Spindles, in six pasteboard cases, 18*s.*
1792. Set of six Conical ditto ditto 1*l.* 1*s.*

1793. Set of six Cylindrical Spindles, in a polished wood box, in the style of *fig.* 1769, 1*l.* 8*s.*
1794. Set of six Conical Spindles, ditto. 1*l.* 11*s.* 6*d.*
1795. Set of six Cylindrical Spindles, of a small size, for use in Chemical Researches, where only small quantities of Liquid are obtained, in a mahogany box, 1*l.* 10*s.*

As the specific gravities of liquids are commonly denoted in books, in reference to hydrometers which indicate the direct specific gravity of liquids, in comparison with that of water, taken as a standard, and denoted by 1·000, whilst manufacturers in this country are much in the habit of speaking of specific gravities in reference to the scale adopted by Twaddell, it may be useful to show the relation of the degrees marked on *Twaddell's Hydrometers*, to those which express the direct specific gravity of a liquid. The necessary calculations are made by means of the following Formulæ:—

Let a = any degree of Twaddell's Hydrometer.
x = specific gravity in relation to water taken at 1·000.

Formula 1.—To convert Twaddell's degrees into sp. gr. $x = 1 + (a \times \cdot 005)$

Formula 2.—To convert sp. gr. into degrees of Twaddell. $a = \frac{x - 1}{\cdot 005}$

Example 1.—If a liquid marks 5 of Twaddell, what is its sp. gr. ?

By *Formula* 1.—Sp. gr. $= 1 + (5 \times \cdot 005) = 1 \cdot 025$.

Example 2.—If a liquid has the sp. gr. of 1·850, what degree of Twaddell's scale will that indicate ?

By *Formula* 2.—Twaddell $= \frac{1 \cdot 850 - 1}{\cdot 005} = \frac{850}{\cdot 005} = 170$.

Hence 5 of Twaddell = specific gravity of 1·025. And 170 of Twaddell = specific gravity of 1·850.

TABLE OF SPECIFIC GRAVITIES INDICATED BY TWADDELL'S SCALE.

Twaddell.	Sp. Gr.	Twaddell.	Sp. Gr.	Twaddell.	Sp. Gr.	Twaddell.	Sp. Gr.
0	1000	50	1250	100	1500	150	1750
10	1050	60	1300	110	1550	160	1800
20	1100	70	1350	120	1600	170	1850
30	1150	80	1400	130	1650	180	1900
40	1200	90	1450	140	1700	190	1950

METALLURGIC MINERALOGY.—Collections of Ores of the Principal Metals, with a Catalogue of Names and Localities.

1796. One hundred Specimens, 3 square inches, 4*l.* 4*s.*
1797. One hundred Specimens, 4 square inches, 5*l.* 5*s.*
1798. Fifty Specimens, 6 square inches, 3*l.* 13*s.* 6*d.*

MINERALOGY.—COLLECTIONS OF SPECIMENS OF SIMPLE MINERALS, arranged in systematic order, according to the last edition of WILLIAM PHILLIPS'S *Elementary Introduction to Mineralogy.* The Specimens are well selected, fresh, clean, characteristic, and accurately named.

1799. Two hundred Specimens, size 4 square inches, 5*l.* 5*s.*
1800. Three hundred Specimens, ditto 7*l.* 7*l.*
1801. Four hundred Specimens, size 6 square inches, 14*l.*
1802. Five hundred Specimens, ditto 20*l.*

1803. GRIFFIN'S CABINET for BEGINNERS in the STUDY of MINERALOGY and GEOLOGY, 2*l.* 2*s.*

1804. Ditto, a superior collection, 2*l.* 10*s.*

This collection contains fifty specimens of simple Minerals, fifty specimens of Rocks, and fifteen models of Crystals, contained in a strong and neat pasteboard Cabinet, with five divided trays. It is accompanied by a book containing an Introduction to the Sciences of Mineralogy and Geology, with a particular description of every specimen contained in the Cabinet. The size of the specimens in the Cabinet at 2*l.* 2*s.* is two square inches. Those in the Cabinet at 2*l.* 10*s.* are a little larger. The BOOK may be had separately, *price One Shilling.*

SMALL COLLECTIONS OF MINERALS (all with Catalogues).

1805. Eighty Fragments of MINERALS for Exercises with the Blowpipe, &c., with a printed Catalogue, in a box, 5*s.*
1806. Fifty-four MINERALS, size one-inch square, 6*s.*
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1808. Fifty-four MINERALS, size two inches square, 9*s.*
1809. The same, in a handsome pasteboard divided box, 15*s.*
1810. One Hundred MINERALS, one inch square, 15*s.*
1811. Fifty-four Specimens of ROCKS and FOSSILS, size one inch square, 6*s.*
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1813. Fifty-four Specimens of ROCKS and FOSSILS, size two inches square, 9*s.*
1814. The same, in a handsome pasteboard divided box, 15*s.*
1815. MOHS'S DEGREES OF HARDNESS OF MINERALS, for Comparative Trials, 9 specimens in a box, with a file, 16*s.*
1816. Ditto, a smaller collection, with a file, 8*s.*
1817. VON KOBELL'S DEGREES OF FUSIBILITY OF MINERALS, for Comparative Trial before the Blowpipe, 6 specimens in a box, 5*s.*

MINERALS, EXAMINATION OF, TO DETECT METALS.

COLLECTION of CHEMICAL APPARATUS and PURE CHEMICAL TESTS, for the QUALITATIVE ANALYSIS of MINERALS. The Instruments all of the best quality and the smallest size, comprehending a complete Blowpipe Apparatus, and also Apparatus for testing in the wet way. The whole affords the means of separating the Constituents of any Mineral, and effecting a complete qualitative analysis.

This Collection is recommended to the attention of Naval and Military Officers, Civil Engineers, Miners, Travelling Mineralogists, Colonial Agents, &c. It contains, in the smallest possible space, the means of deciding whether a *given mineral does* or *does not* contain a METAL, and also *what* METAL it is.

1818. Price of the Collection, in a strong Mahogany Cabinet, 21*l.*
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1820. In some circumstances it will be useful to have a Rough Case, containing an extra supply of such articles as are liable to break, and of such Tests (Acids, &c.) as are used in considerable quantities. A sum of 3*l.* to 5*l.* may be allowed for such a Supplement.
1821. An addition of 5*l.* or 10*l.* will include the cost of a Portable Balance, and such other articles as will enable the operator to effect QUANTITATIVE ANALYSES of the Minerals submitted to examination.

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1822. Price, without a Cabinet, 6*l.* 6*s.*

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1824. MINERALS FOR ANALYSIS, including some that yield RARE CHEMICAL ELEMENTS.

	Price per oz. s.	d.
ARSENIC.		
Native Arsenic, *Andreasberg*	0	6
Orpiment	0	4
Realgar	0	2
Arsenical Iron (Mispickel)	0	6
BISMUTH.		
Native Bismuth, *Saxony*	0	6
ANTIMONY.		
Antimony Feather Ore	0	4
Sulphuret of Antimony	0	1
BARIUM.		
Sulphate of Barytes, *Arran*	0	1
CADMIUM.		
Cadmiferous Blende	0	6
CERIUM.		
Cerite, containing Cerium, Lanthanium, and Didymium	1	0
CHROMIUM.		
Chrome Iron Ore	0	2
COBALT.		
Arsenical Cobalt	0	4
COPPER.		
Grey Copper, *Fahlerz*	0	4
Copper Pyrites, *Cornwall*	0	4
Malachite, *Siberia*	1	0
FLUORINE.		
Fluorspar, free from Silica	0	1
GLUCINUM.		
Beryl	0	6
IRON.		
Native Loadstone	0	6
Clay Iron-stone, *Glasgow*	0	2
Pea Iron Ore	0	2
Red Iron Ore	0	3
Brown Iron Ore, *Amberg*	0	3
Carbonate of Iron, *Bieber*	0	4
Iron Pyrites	0	1
LEAD.		
Galena, *Lead Hills, Scotland*	0	1
Carbonate of Lead, *Freiberg*	0	4
LIME.		
Calcareous Spar, *Dumbartonshire*	0	2
Gypsum, hydrate, Selenite	0	3

	Price per oz. s.	d.
LITHIUM.		
Lepidolite, Rose Mica	0	3
— in lumps	0	3
Petalite	0	6
MAGNESIUM.		
Magnesite, *Bohemia*	0	2
Bitterspar, *Tyrol*	0	6
MANGANESE.		
Grey Manganese	0	2
Psilomelane	0	2
Pyrolusite	0	2
MERCURY.		
Sulphuret of Mercury (Cinnabar), *Deux Ponts*	0	6
MOLYBDENUM.		
Sulphuret of Molybdenum	1	0
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Pitch Blende	0	6
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Zinc Blende, *Hartz*	0	6
Cadmiferous Blende	0	6
Calamine	0	2

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	Diameter.	Price.					Diameter.	Price.				
		s.	*d.*		*s.*	*d.*		£.	*s.*		£.	*s.*
1825.	1½ inches . .	7	6	to	9	0	1830. 2¾ inches . .	0	18	to	1	4
1826.	1¾ inches .	9	0	to	10	0	1831. 3 inches .	1	6	to	1	10
1827.	2 inches . .	10	0	to	12	0	1832. 3¼ inches . .	1	10	to	1	13
1828.	2¼ inches .	12	0	to	14	0	1833. 3½ inches .	1	14	to	1	16
1829.	2½ inches . .	14	0	to	18	0	1834. 4½ inches . .	4	0			

ORGANIC ANALYSIS, LIEBIG'S APPARATUS FOR.

All the Apparatus for Organic Analysis made in Germany after the latest and most approved patterns. See *General Catalogue*, pp. 37 and 72.

1835. COMBUSTION TUBE, in lengths of 3 feet, of hard white Bohemian glass, imported direct, and *warranted to be of the best quality*, per lb. 2*s*. 6*d*., or 25 lb. for 50*s*.

1836. Horsford's Improvement of Varrentrapp and Will's Apparatus for the estimation of Nitrogen; best make, thin light German glass, 1*s*. 6*d*.

1837. Liebig's Potash Bulbs, of German glass, very light, in a pasteboard box. *fig*. 1837 *m*, 3*s*.

1838. Liebig's Chloride of Calcium Tube, one bulb, straight, very light, *fig*. 1837 *b*, 6*d*.

1839. Liebig's New Desiccating Tube, U-shape, with a bulb, fitted with cork and tube, 1*s*. 6*d*.

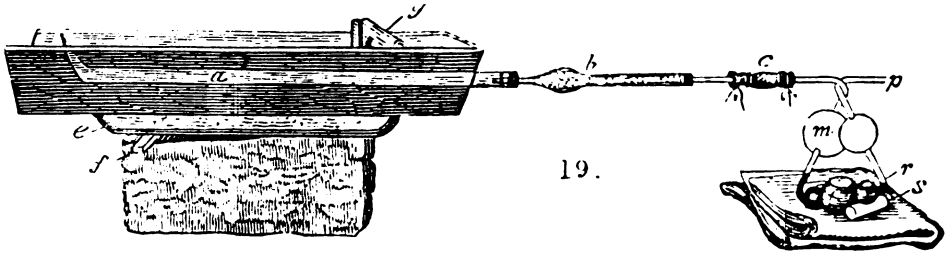

Fig. 1837.

1840. Stenhouse's Improved Combustion Furnace for Organic Analysis, 5*s*.
By making a greater number of supports, and turning over the edge of each, the cutting of the softened tube is prevented.

1841. Leaf Copper to envelope the Combustion Tube when heated for the Nitrogen process, to prevent its flexure, 3*s*. per lb.

1842. Pure Metallic Copper, in filaments of extreme thinness, 8*s*. per lb.

1843. A Complete Set of Liebig's Tube Apparatus for Organic Analysis, comprising 18 articles, 18*s*.

1844. Liebig's Instructions for Organic Analysis, translated by Professor Gregory, 2*s*. 6*d*.

1845. WATER TEST, PROFESSOR CLARK'S.—STANDARD SOLUTIONS and APPARATUS for DETERMINING the HARDNESS of WATER, according to the Process of PROFESSOR CLARK. Particulars will be given in our next Circular.

SACCHAROMETER (HERMBSTADT'S).

Fig. 1847.

This Instrument has been found of great use by persons engaged in the MANUFACTURE of SUGAR from CANE JUICE, and also by SUGAR REFINERS. It is a glass spindle, of the form of *Fig.* 1847, containing two written scales. One of these shows the specific gravity of a solution of sugar, from 1·000 (= pure water) to 1·400 (= saturated solution of sugar at 64° Fahr.) The other scale goes from 0° to 75°. It shows the *percentage of sugar*, or the proportion, by weight, in 100 parts by weight of the syrup. That is to say, it shows how many pounds of sugar are contained in 100 pounds of the syrup.

The following Varieties may be had :—

1846. The Spindle alone, without Thermometer, form of *fig.* 1768, 8*s.*

1847. The Spindle alone, with a Thermometer inclosed in the Cylinder, as shown in *fig.* 1847;—the scale of the Thermometer written on paper, 14*s.*

1848. The same, with the scale of the Thermometer painted on milk glass, 16*s.*

The above are in round pasteboard boxes.

The following in square polished wooden boxes :—

1849. The Spindle having a Thermometer with paper scale, and a trial-jar for the syrup, in a polished wooden box, in the style of *fig.* 1769, 28*s.*

1850. The same, with a glass scale to the Thermometer, 30*s.*

TEST TUBES OF THE BEST THIN HARD WHITE BOHEMIAN GLASS, closed and properly rounded at one end, and bordered at the mouth, *Fig.* 1851. *Well annealed.*

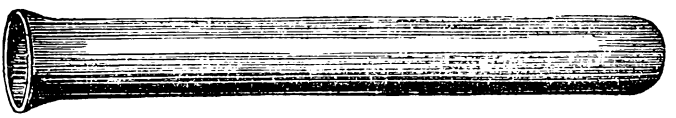

Fig. 1851.

	Width across the middle.	Length in Inches.				Per Dozen.	
						s.	*d.*
1851.	Quarter-inch . .	1	1½	2	—	1	0
1852.	One-third inch . .	2	2½	3	—	1	6
1853.	Half inch . . .	2½	3	3½	—	2	0
1854.	Half inch . . .	4	5	5½	—	2	6
1855.	Three-quarter inch .	3	3½	4	4½	3	0
1856.	Three-quarter inch .	5	5½	6	—	4	0
1857.	One inch . . .	3	4	5	6	5	0
1858.	One inch . . .	6½	7	7½	—	6	0
1859.	Above one inch . .	6	7	8	—	8	0

1860. Test Tubes: a nest of Six, from 4 to 7 inches long, in a pasteboard box, for travelling, 1*s.* 6*d.*

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